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PopularScience

Tuberculosis
Dengue
Ebola
AIDS
Hanta

Why We're Losing the Fight Against
Deadly Disease

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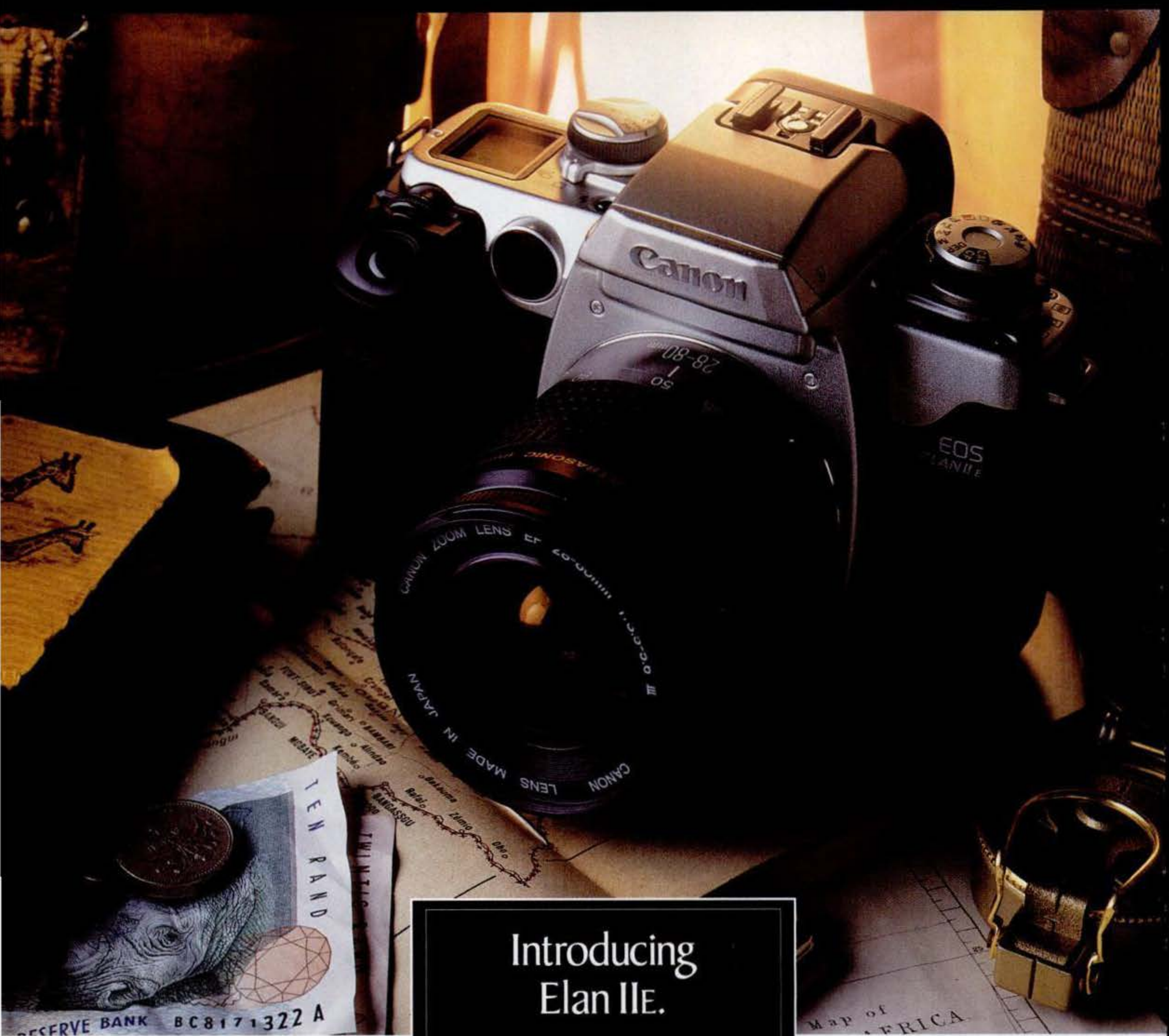

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THE WHAT'S NEW MAGAZINE

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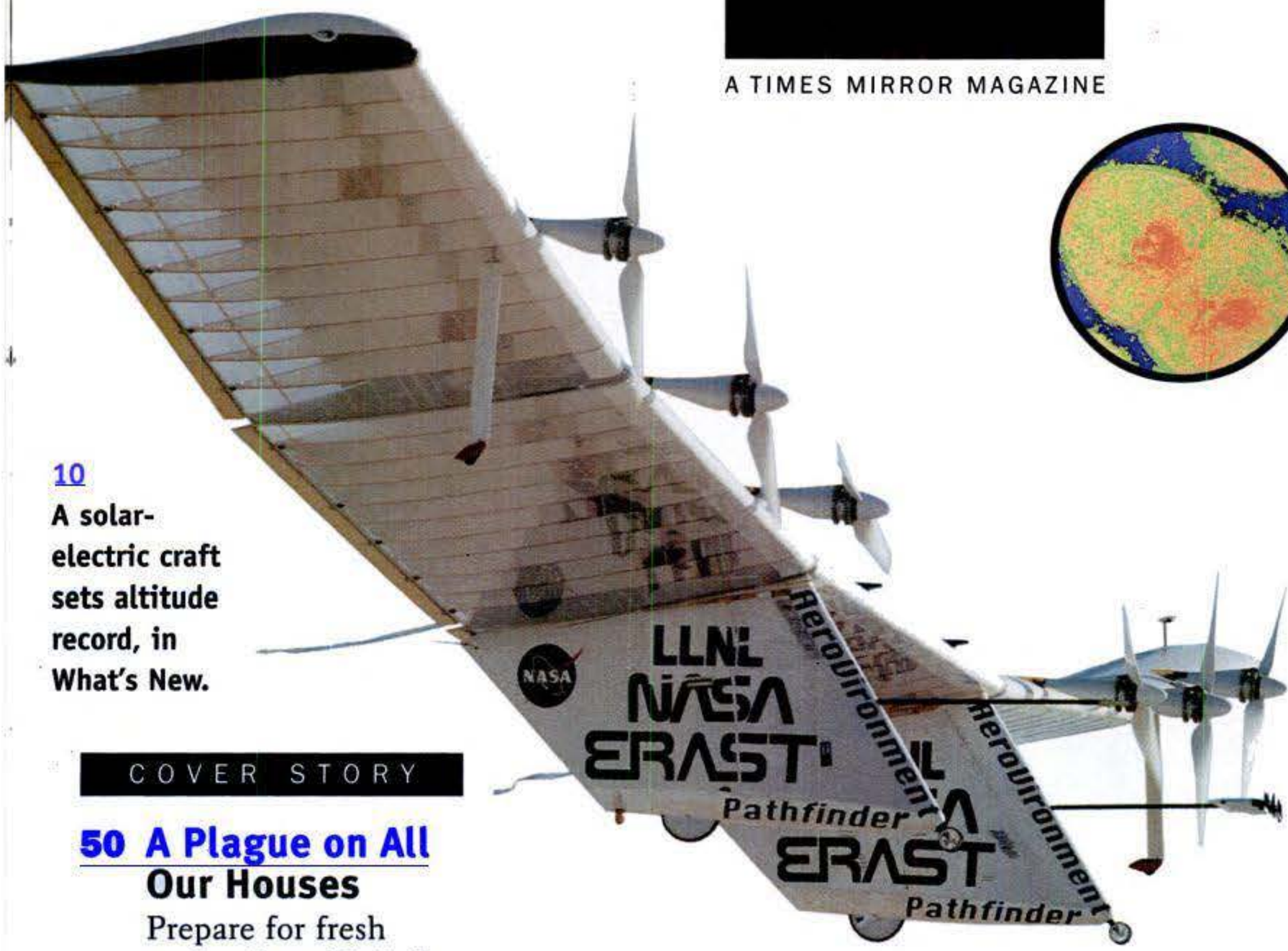

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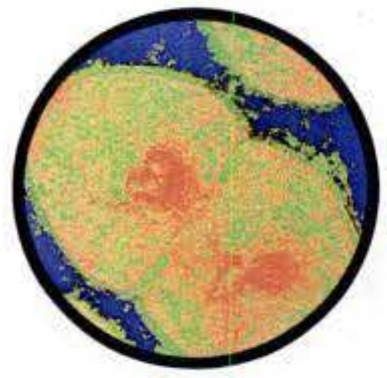
A solar-electric craft sets altitude record, in What's New.



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Flesh-eating bacteria and other nasty bugs.

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50 A Plague on All Our Houses
Prepare for fresh onslaughts of lethal infectious diseases, new and old.

Cover art by Amy Guip

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Founded in 1872 Volume 248 Number 1

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Miniaturized multimedia in Computer Newsfront.

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Fitness Guide: Is this the shoe for you?

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She got the house, the car, and the furniture.

(And you're still married.)

With all due respect to your better half, perhaps it's time you balanced things out a little. Well, a Pioneer® Cinema Wide Television certainly would be a great way to start. It simply gives you more

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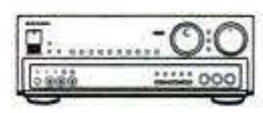

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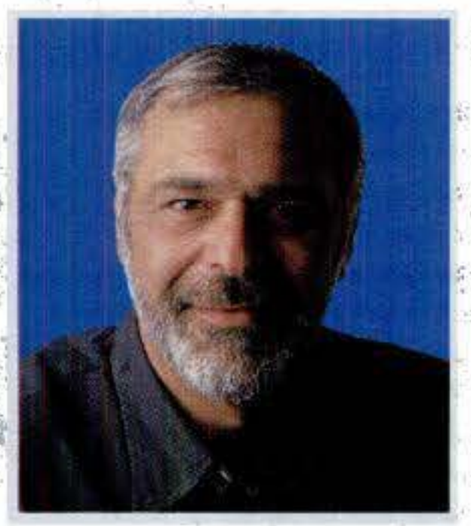

From the Editor-in-Chief

EMERGING DISEASES—some old foes, others new potential plagues—are not just the stuff of Hollywood movies and tabloid headlines. There are plagues among us that are challenging medical science in the laboratories and on the front lines of our local hospitals. Some of these viral foes are exotic strains, brought to the fore by the relentless push of the world's population into areas formerly uninhabited. And a world shrunk by global transportation makes their presence possible in all the far corners of the earth. As author Robert Cooke points out in this month's cover story, we can't afford to be complacent about disease.—*Fred Abatemarco,* **popscied@aol.com**

More Than a Gesture

THE GESTURE organ you describe in "Hypermusic" [Oct. '95] bears a remarkable resemblance to the theremin, invented in 1920 by Leon Theremin. The theremin's pitch was determined by the proximity of the player's right hand to the instrument's vertical antenna; the volume was controlled by moving the left hand near the horizontal antenna.

Jim Legans
76634.1522@compuserve.com

THE GESTURE frame, gesture organ, and gesture cube indicate a resurgence of the theremin—although the new instruments are digitally notched to each note rather than sliding in the fretless fashion of the theremin. Perhaps we will also see a resurgence of the '60s rock band, "Lothar and the Hand People," to demonstrate these new devices.

M. Allen Schultz
Williston, Md.

Apollo 13's Lasting Nuclear Legacy

YOU MISSED something in "Apollo 13: What the Moviemakers Missed" [FYI, Oct. '95]: The SNAP-27 (Systems for Nuclear Auxiliary Power), which sat aboard the Lunar Excursion Module to supply energy for experiments on the moon. Intended to be left on the lunar surface, the SNAP-27 contained 8.3 pounds of highly radioactive plutonium. The lunar module didn't drift off into space, as in the movie. It fell to Earth, survived reentry, and unfortunately, now rests in the Tongo Trench in the South Pacific. This location is "effectively isolated from man's environment," claims NASA. But I don't consider the ocean to be isolated from my environment—especially knowing that the plutonium will be hot for 2,000 years, and that SNAP's ceramic container can crack.

Joe Brich
joleo@delphi.com

The Eyes Have It

IN YOUR comparison of computer pixels and human eye resolution [FYI, Nov. '95], you state that there are one million "sensors" in the human eye. Not exactly! To expand on your description, each eye contains some 130 million rods (photosensitive receptors) and 7 million cones (which are involved in color perception). These all interact and converge with the approximately 1 million fibers that make up the optic nerve. Eyes also move more than three or four times each second, as you state. Microsaccades, or minute, jerky eye movements, occur 20 to 30

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times per second, depending on eye position and fixation target. Therefore, the possible equivalent "sensors" in human eyes exceed a half billion. Nothing manmade comes close.

Dr. Jeffrey Anshel
Optometrist
71534.1745@compuserve.com

Around the Text World

IN THE "Beyond Here" column about virtual worlds [Computers and Software Newsfront, Oct. '95], you mention that online chats are nothing new. But neither are virtual worlds: On the internet, you can access various worlds called "MUDs" (for multiuser dimensions). In these you can "live," "die," "kill," and even "get married."

Vince Malave
via e-mail

Replay it Again, Sam

MAGNAVOX'S Instant Replay feature, which plays back four to five seconds of video in a small onscreen window, is not unique [Electronics Newsfront, Nov. '95]. I've had the same feature for about four years on my Panasonic Prism TV. Overall it's pretty useless—there's no sound, the picture is small, and the playback is choppy. But it is fun to see Michael Jordan dunk over and over and over again.

Stuart Koch
BarbK1078@aol.com

Political Science

IN "DARK DAYS for Science" [Oct. '95], Rep. George Brown, the former chairman of the House Science Committee, sounds like Chicken Little saying, "the sky is falling" when he talks about the state of science funding. Nothing could be farther from reality. The plan from the current chairman, Rep. Robert Walker, eliminates "pork" projects—reducing duplication of work by creating a much-needed Department of Science—and preserves funding for worthwhile projects like the space station and developing hydrogen fuel. Secure multiyear funding, without the constant threat of cancellation, is how cost-effective science can be accomplished. But at the same time, a balanced budget means that we will all feel some pain, including scientists, to make a brighter future.

Mark Usiciak
Lancaster, Pa.

REP. WALKER reveals disturbing priorities: cold fusion and the space station. Given the fiscal realities that scientists and all Americans must face, where does America want to be in 20 to 40 years? Chasing a shrinking oil supply and watching a space station on TV? Or becoming a net energy producer through zero-pollution hot fusion or solar-power techniques?

Ben Meyer
Via fax

A Primary Matter

MITSUBISHI MAY be first with an automotive application of the direct-injection engine, but it's not an all-time first [Automotive Newsfront, Aug. '95]. Built in the 1950s, the Wright R-3350 Turbo-Compound aircraft engine was used on the DC-7, the later versions of the *Constellation*, the Navy's P2, and other aircrafts. The R-3350 was a twin-row, 18-cylinder, air-cooled reciprocating engine, which produced 3,350 horsepower.

Larry Mechem
Juliette, Ga.

CORRECTIONS: *A picture of Mazda's demonstration Hydrogen Vehicle incorrectly accompanied an item on the Mitsubishi prototype Hybrid Electric Vehicle [What's New, Nov. '95].*

The Bose Lifestyle 20 music system sells for about $2,500 [Best of What's New, Dec. '95].

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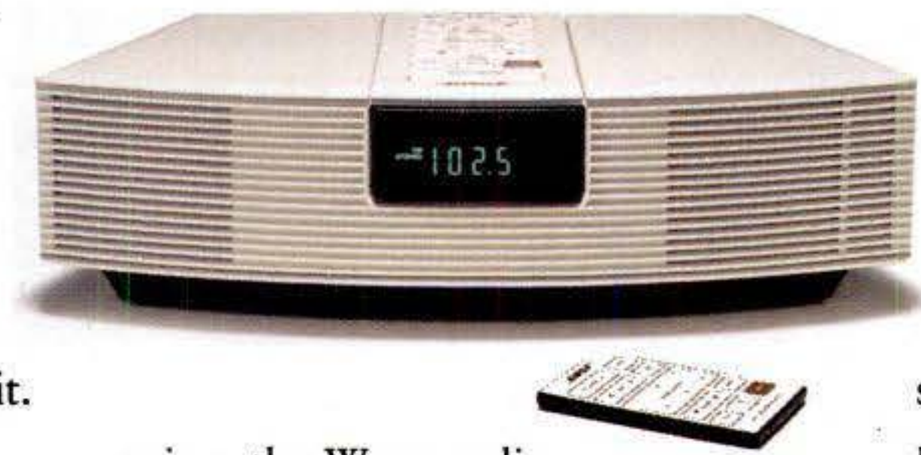
Touch a button and hear your favorite music come alive in rich, lifelike stereo sound—sound that lets you hear every note the way it's *meant* to be heard. Which is why it's well worth $349. No matter what kind of music you enjoy, the Wave radio will truly increase your listening pleasure. Consider that *Popular Science* honored the Wave radio with a "Best Of What's New" award. *BusinessWeek* named it a "Best New Product of 1994." And it measures just 4.5″H × 14″W × 8″D, so it's small enough to fit almost anywhere. You can listen in your bedroom, living room, kitchen, or any room.



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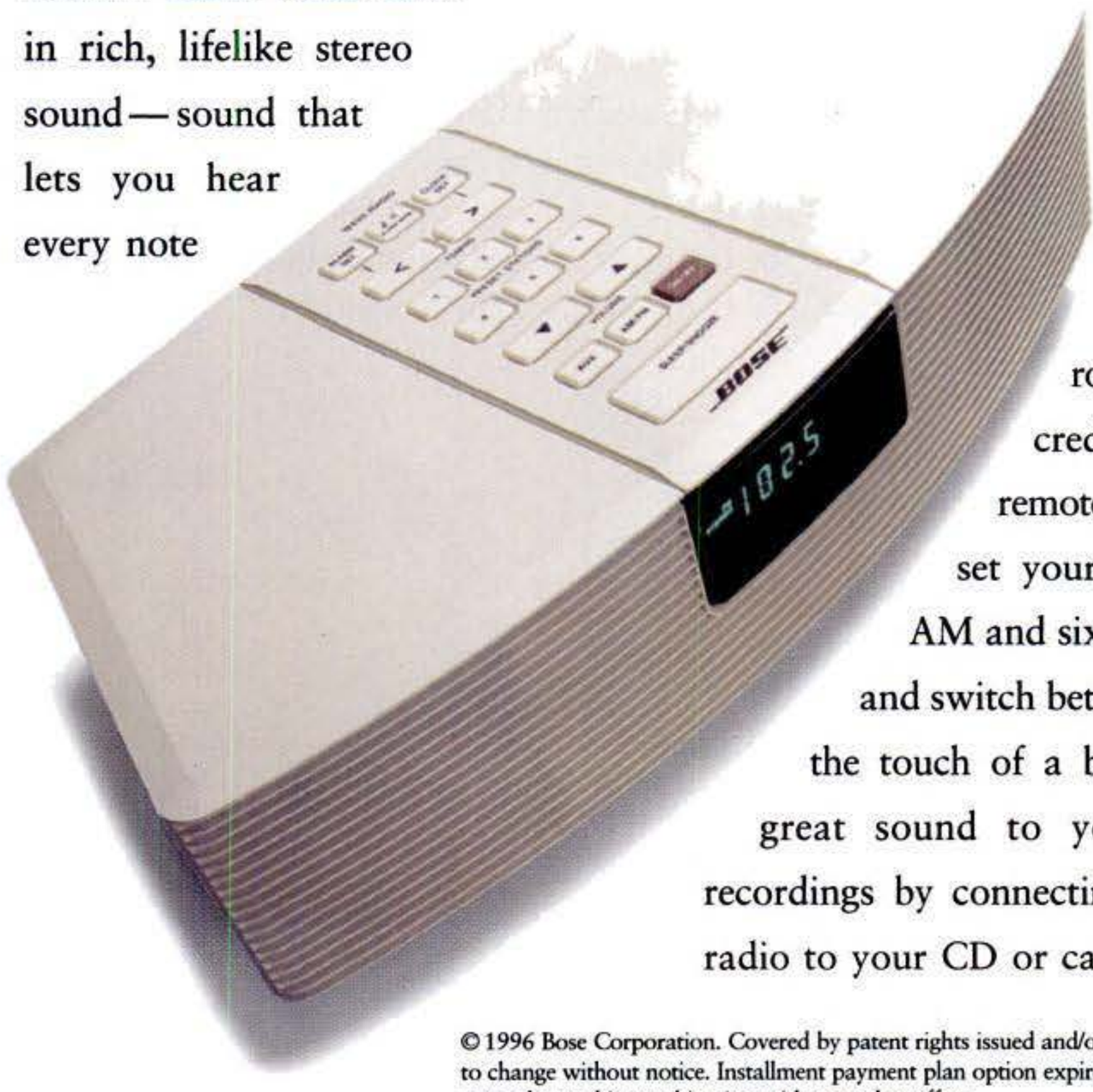

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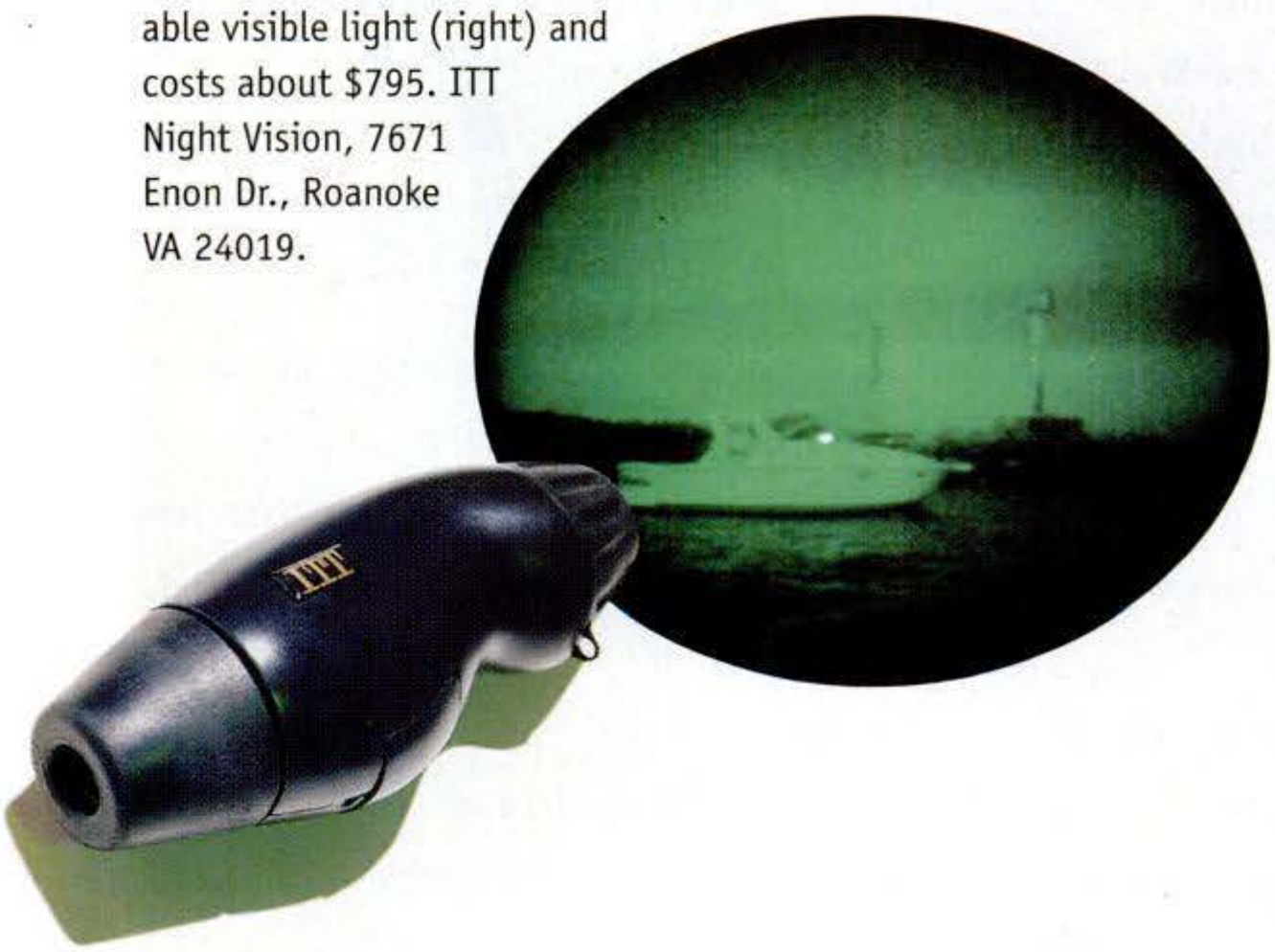
WHAT'S NEW

EDITED BY MARIETTE DICHRISTINA AND SUZANNE KANTRA KIRSCHNER

Small and Handy

CRADLE DIMUNITIVE Night Quest 100 in the palm of your hand and you're ready to take advantage of Generation II night-vision technology, which has been declassified from the military for commercial use. The scope enhances available visible light (right) and costs about $795. ITT Night Vision, 7671 Enon Dr., Roanoke VA 24019.



Solar High Flyer

OUTFITTED WITH a new solar array and other refinements, the AeroVironment Pathfinder recently climbed to 50,500 feet—setting a new altitude record for solar-electric aircraft. Due to headwinds, the unpiloted low-speed craft was actually moving slightly backward when it touched down after 12 hours aloft. Engineers hope to send Pathfinder up to 65,000 feet high, then bring it down for a nighttime landing. The testing is being conducted at California's Edwards Air Force Base under a NASA program.

Face-Lift for Paseo

TOYOTA'S PASEO gets an inside-and-out redesign for 1996. The second-generation sporty economy coupe has larger windows and a lower dashboard for improved visibility, along with increased interior storage space. A 93-horsepower 1.5-liter engine powers the Paseo. Base price: about $13,000.

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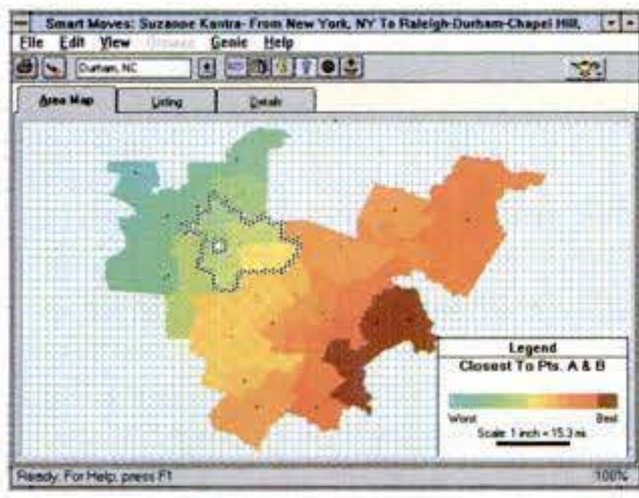
Relocation Guide

THE SMART MOVES 2.0 relocation guide helps you find the perfect community—and in your price range. You input personal-finance information and list your concerns, such as school system, crime levels, and home size. The software displays a map of suitable communities (shown) and even calculates closing and moving costs. The $40 price includes quarterly data updates. PHH Technology Services, 10955 Lowell Ave., Ste. 210, Overland Park KS 66210.

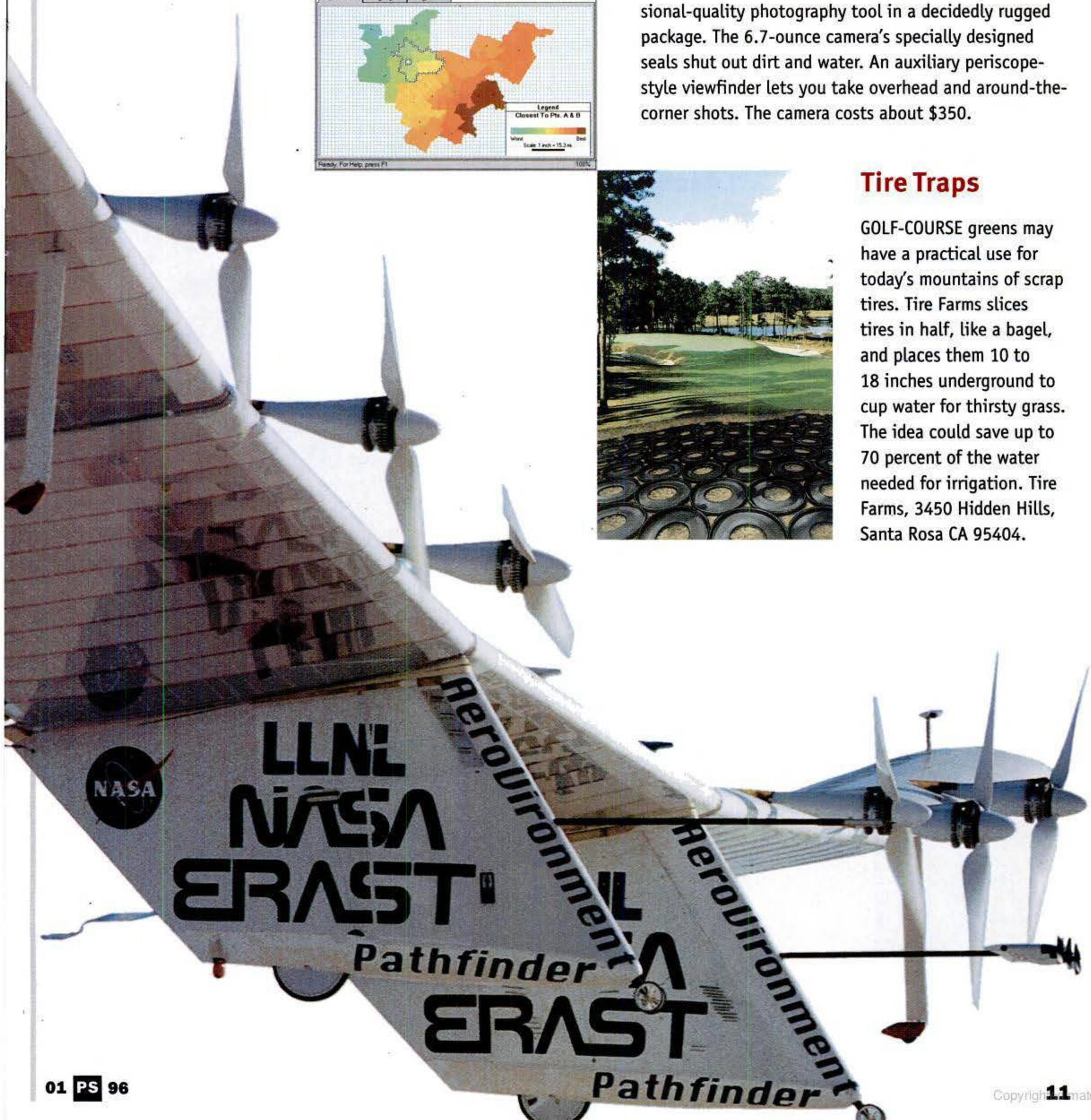


Little Package, Big Features

WITH ITS IMPRESSIVE Carl Zeiss Tessar f3.5T* lens, Yashica's T4 Super Weatherproof camera is a professional-quality photography tool in a decidedly rugged package. The 6.7-ounce camera's specially designed seals shut out dirt and water. An auxiliary periscope-style viewfinder lets you take overhead and around-the-corner shots. The camera costs about $350.

Tire Traps

GOLF-COURSE greens may have a practical use for today's mountains of scrap tires. Tire Farms slices tires in half, like a bagel, and places them 10 to 18 inches underground to cup water for thirsty grass. The idea could save up to 70 percent of the water needed for irrigation. Tire Farms, 3450 Hidden Hills, Santa Rosa CA 95404.



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William P. Godfrey,
with his computer work center #2337
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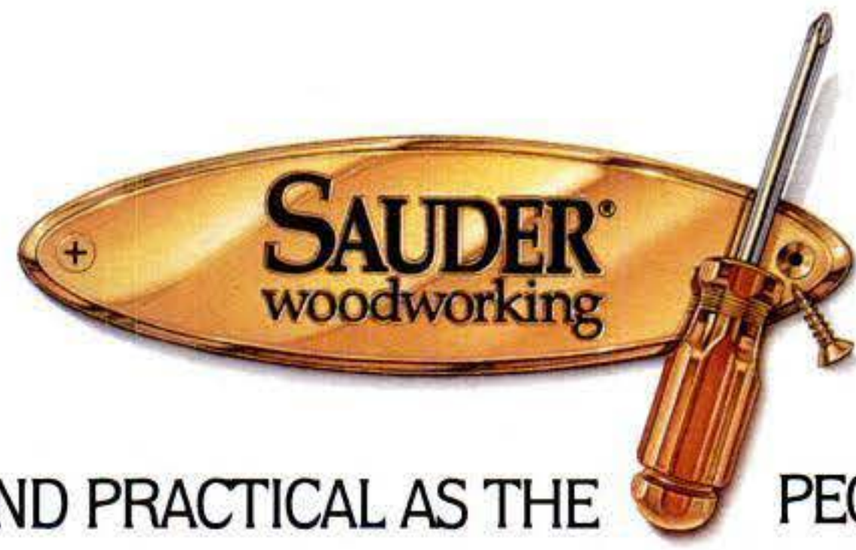

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More smart, practical, Sauder furniture. Shown here, part of the Wilmington Collection.

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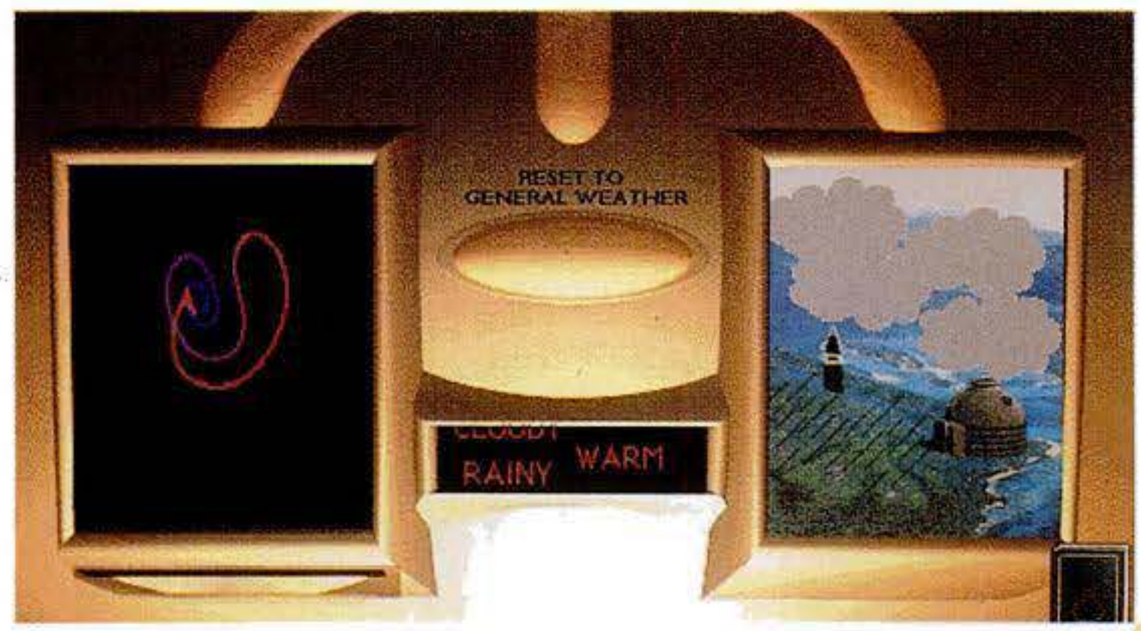
Patterns in Chaos

CHAOS THEORY finds ordered, mathematically consistent descriptions of seemingly unpredictable occurrences. Chaos, the game, creates a world of backward clocks, an infinite coastline, and a fractal forest. To solve puzzles, you manipulate chaotic systems such as weather (shown) and the stock market. Price: $50. Harper Collins, 10 E. 53rd St., New York NY 10022.

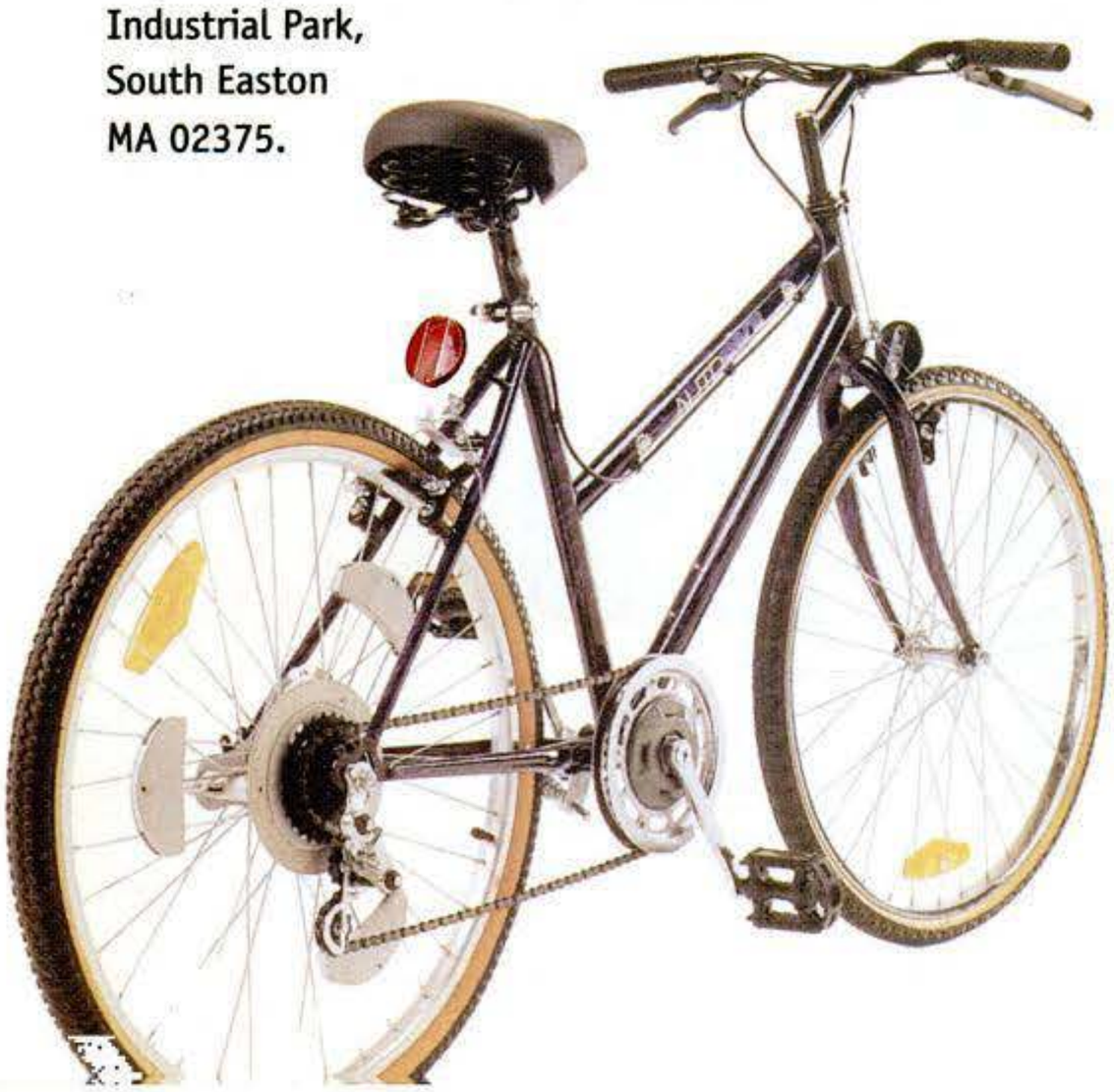


Just Us Two

BMW CALLS its skeletal fun-mobile Just 4/2 ("Just for Two"). Suggesting a four-wheel motorcycle that's all chassis with no body, it packs a 100-horsepower 1,100cc bike engine behind the open cockpit that rockets the 1,100-pound car to 62 mph in six seconds. An aluminum profile frame swings around the occupants for security while supporting the running gear, suspension, and power plant, and a sturdy rollbar loops overhead. BMW of North America, 300 Chestnut Ridge, Woodcliffe Lake NJ 07675.

Auto Shift

AUTOBIKE AIMS to help casual cyclists who like the consistent pedaling effort provided by bicycle gears—but hate the complexity of doing the actual shifting themselves. Three weights slide along Autobike's rear-wheel spokes as you pedal faster, using centrifugal force to shift the bike among its six speeds. This maintains a steady pedaling rate around 65 rpm. The price range is about $300 to $500, depending on model. CSA, 23 Norfolk Ave., Easton Industrial Park, South Easton MA 02375.



No-Bounce Pucks

ACTIVE GRAVITY System pucks and balls make street-hockey play closer to the ice experience: A patented dampening system reduces bounce, keeping the puck (shown) or ball on the street. Prices: about $10 (puck) and $3 (ball). Franklin Sports, Box 508, Stoughton MA 02072-0508.

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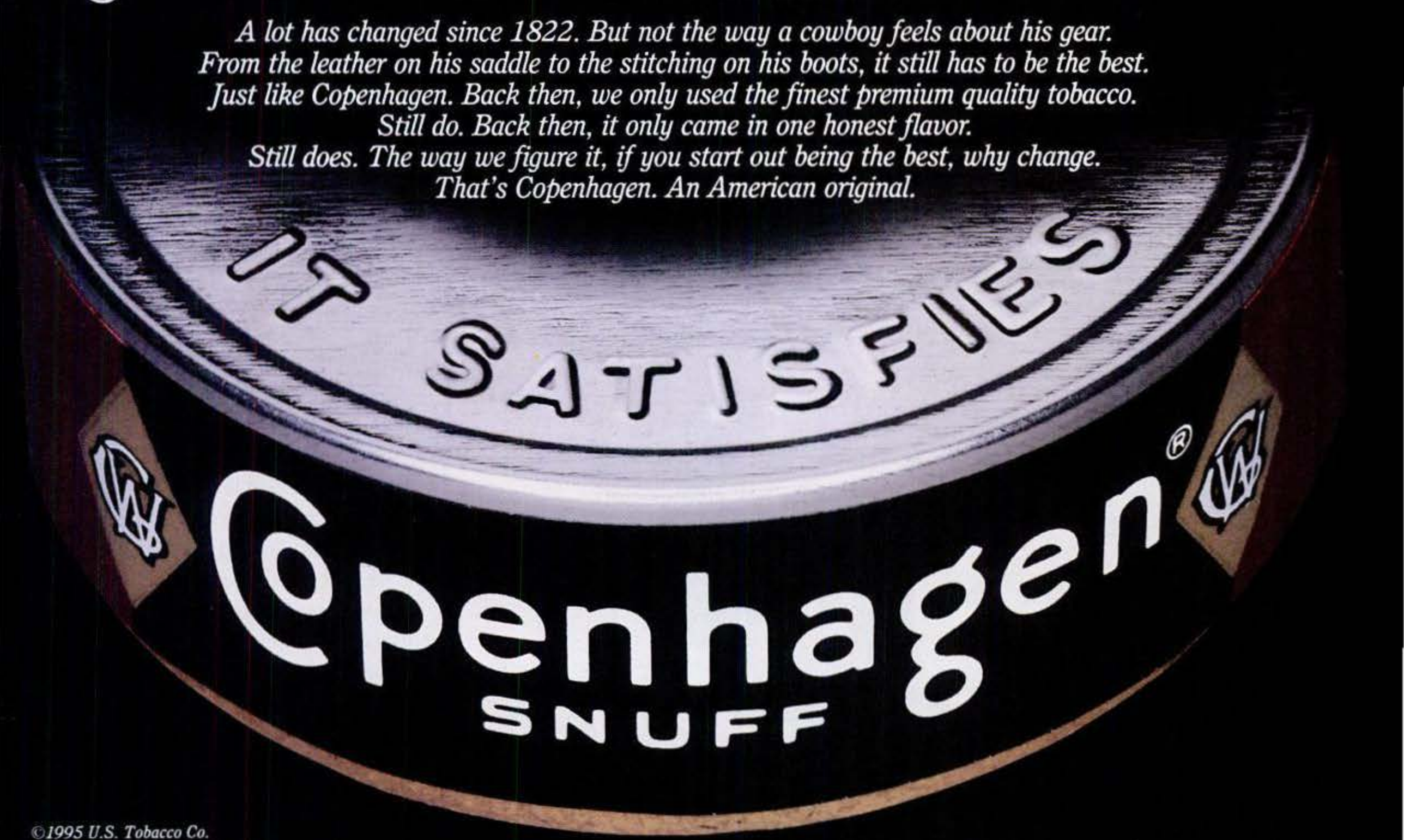

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On-the-Go Laser

FIELD MEDICS using the Laser Medical Pac could quickly cauterize arterial bleeding to stabilize an injured soldier. Developed by the Air Force Phillips Laboratory, the battery-powered laser measures just 7 by 3 by 2.5 inches and operates for about 40 minutes without recharging.

Fore!

SWIN GOLF'S patented three-in-one club serves as a driver, wedge, and putter. You use a ball that is larger and softer than a traditional golf ball; because that ball won't fly as far, golf now becomes a backyard sport. Price: about $150 for a four-player kit (including balls and other items to set up a course), or about $30 per club. Swin Golf Corp., Box 8172, Newark DE 19714-8172.

Electric RAV

TOYOTA'S RAV4L model serves as the basis for some 20 electric vehicles that the company is now building for testing in the United States and Japan. The sealed lead-acid batteries are charged on ordinary household current. Storing the batteries under the floor maintains cabin space for passengers. The top speed is about 70 mph, with a range of about 70 miles before the battery needs to be recharged.

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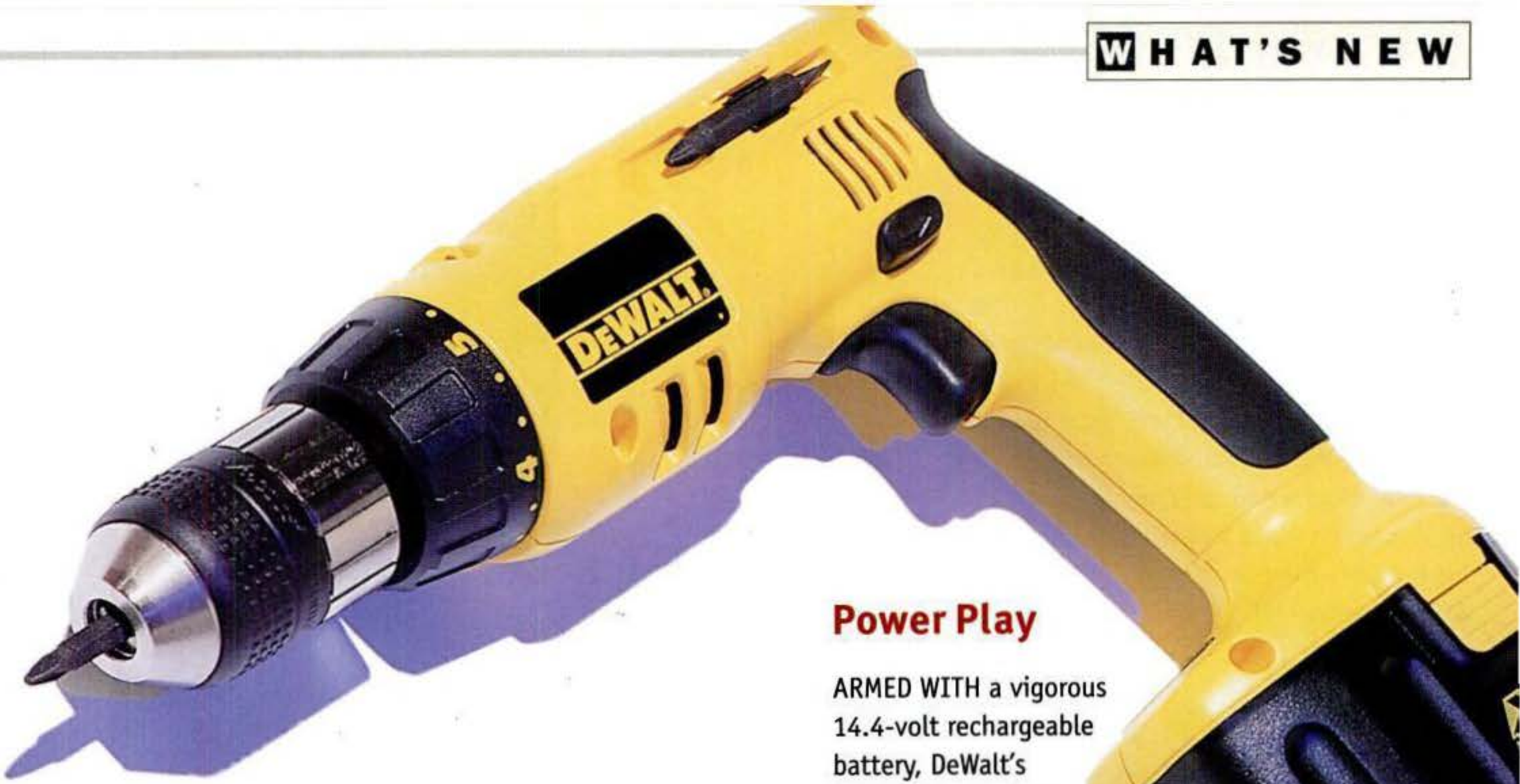
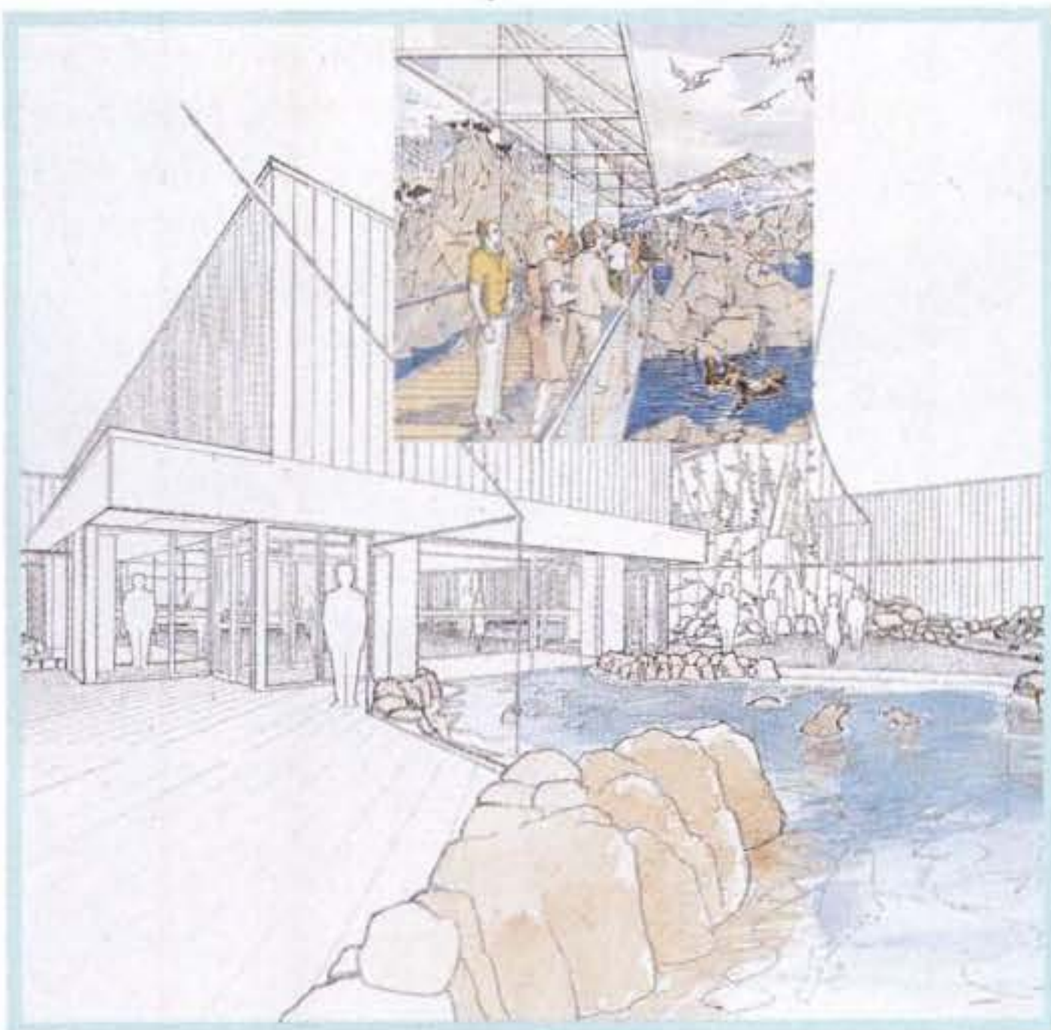


Power Play

ARMED WITH a vigorous 14.4-volt rechargeable battery, DeWalt's DW996K is the first cordless drill/driver that's a hammer drill, too, for masonry applications. The $396 tool is equipped with a 1/2-inch keyless chuck and adjustable clutch; the XR Pack battery recharges in one hour. A 12.0-volt version is also available, for $382.



On-Land Ocean Exploring

THE ALASKA SEALIFE Center will be the first cold-water marine institute in the Western Hemisphere. Built with funds from the *Exxon Valdez* oil spill legal settlement, the $47.5 million center will study Alaskan coastal ecosystems and provide educational resources. It is expected to open in 1998. Alaska SeaLife Center, Box 1329, Seward AK 99664.

It Only Looks Fishy

YOU WATCH the rising bubbles as goldfish glide around the aquarium. Look closer: Those fish are laser disc images played on a high-definition monitor. A thin water tank and air pump provide the bubbles. NEC will sell the Sakana Hakkei system in Japan for hotels, hospitals, and other facilities. The price is not yet set.

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Thrills from Wisconsin

ENGINEER ERIK BUELL takes a hopped-up 91-horsepower Harley-Davidson 1200cc engine and wraps it with a bare minimum of chassis and suspension bitties to make the S1 Lightning. Lightweight at 425 pounds unfueled, the S1 is a minimalist sport machine designed for precise handling on serpentine roads. Price: $10,000. Buell Distribution Corp., Box 653, Milwaukee WI 53201-0653.

Quick Change

PORTER-CABLE'S model 9737 Quik-Change Tiger Saw Kit makes fast work of changing reciprocating-saw blades. In seconds, you can turn the spring-loaded clamp, remove a worn blade, and insert a new one. Price: $205. Porter-Cable, 4825 Hwy. 45 N., Box 2468, Jackson TN 38302-2468.

New C-Note

THIS YEAR, $100 bills will look different for the first time in 67 years: A new portrait of Benjamin Franklin will be larger and off center. Among the anti-counterfeiting measures are a security thread that glows in ultraviolet light, color-shifting ink, and difficult-to-reproduce concentric fine-line printing. By 2001, all greenback denominations will be redesigned.

Comfy Creeper

IT'S BAD enough that you're on your back, your face inches from dripping oil under your car—does the creeper have to be uncomfortable and wobbly too? Not anymore: The Bone cradles your head and spine on a curved platform. The larger-than-usual industrial wheels (under the "bone" curves) also make for a sturdier creeper. Pegasus Products Co., 315 Gougler St., Kent OH 44240. Price: about $120.

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Gillette SensorExcel With Protective Microfins.

There's no razor in the world like SensorExcel.™

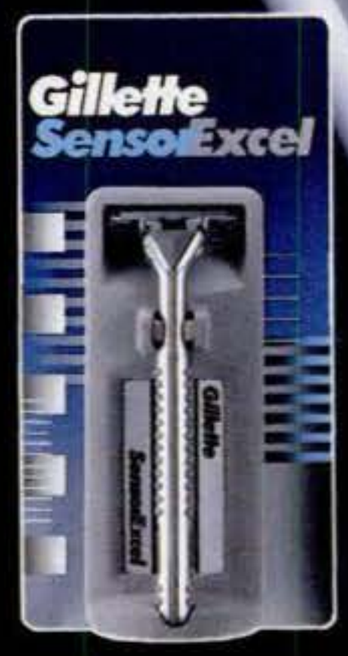
It's the only one with individually spring-mounted twin blades and soft protective microfins.

The twin blades adjust to every curve of your face and every detail of your skin. The microfins are positioned in front of the blades. They protect your skin and set-up your beard for the

closest, most comfortable shave ever.

SensorExcel also has a responsive Flexgrip® handle and pivoting head for superior maneuverability and control.

The result is the best shave anywhere–on any kind of skin, any kind of face.



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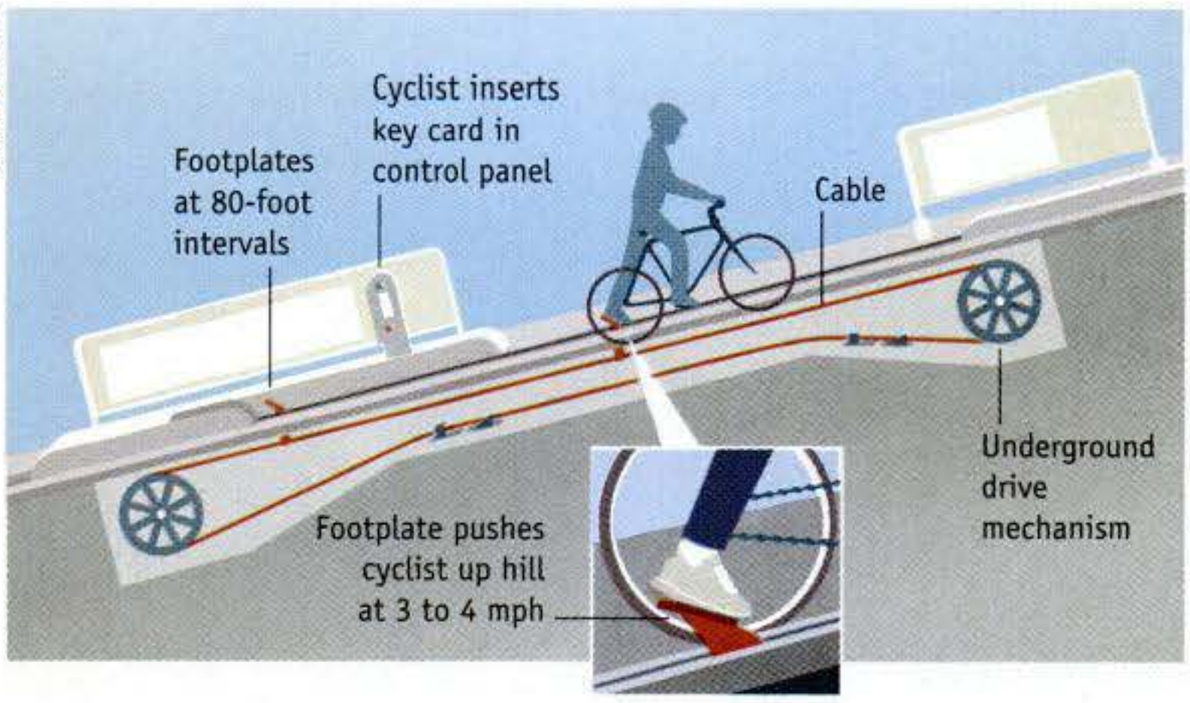

Uphill Helper

CAN'T FACE PEDALING up yet another steep hill? You're in luck—if you live in Norway. Just hook up your bicycle to the Bike Lift, and away you go. Management AS, Teknostallen, Prof. Brochs gt. 6, N-7030 Trondheim, Norway.

More Players

ADVANCED GRAVIS' MultiPort GrIP interface enables four people—double the usual number—to play a game on one computer simultaneously. The all-digital system also reduces the period of time between your action and the game's reaction—making fast-action sports and fighting games feel more like those on dedicated game platforms. The price of around $100 includes two controllers and a game. Advanced Gravis, 1790 Midway Lane, Bellingham WA 98226.

Easy Shifter

THE TWIST-GRIP shifting on this clever hub gearing puts smooth cycling literally in the palm of your hand. Available in four- and seven-speed versions, the internal epicyclic Nexus S97 R40 gearset eliminates the exposed cogs and complexity of conventional derailleurs. A roller brake provides all-weather stopping power, replacing the usual rim calipers. Shimano American Corp., 1 Shimano Dr., Box 19615, Irvine CA 92713-9615.

Tent on Wheels

MAZDA'S BONDO Friendee camper RV is a base camp on wheels with its built-in refrigerator, gas stove, water tank, and sink. A pop-up roof provides screened-in space for sleeping. Available in Japan, the fully equipped camper model sells for about $34,000.

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Electric Replica

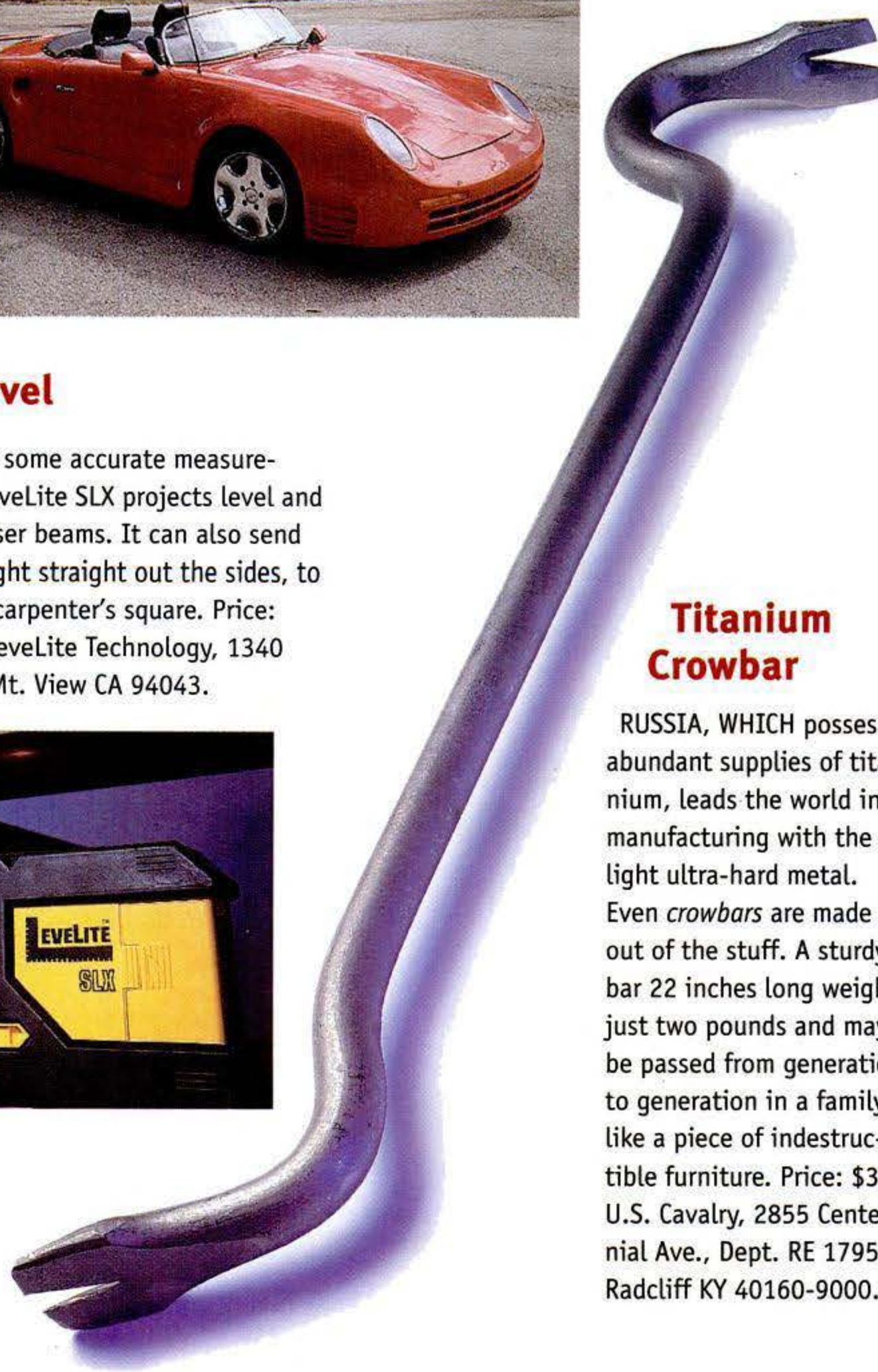
ENGINEERS AT Texas A&M started with a 1973 VW Beetle and a Porsche 959 replica kit. They added 12 lead-acid batteries, a 30-horsepower electric motor, and a high-power, high-efficiency controller from Dax Industries of Houston. The racy red result goes from 0 to 60 mph in under 10 seconds, with a top speed of more than 100 mph. Range is 30 to 40 miles. The car cost $50,000 to build.

Proof Positive

THIS BRITISH fingerprint reader verifies identity for secure financial transactions and controlled-access areas. After capturing a print pattern optically, the device converts it to a digital code. The user keys in a PIN number, which calls up a unique recorded digital fingerprint code; the comparative check takes just two seconds. CRL Dawley Rd., Hayes, Middlesex UB3 1HH, England.

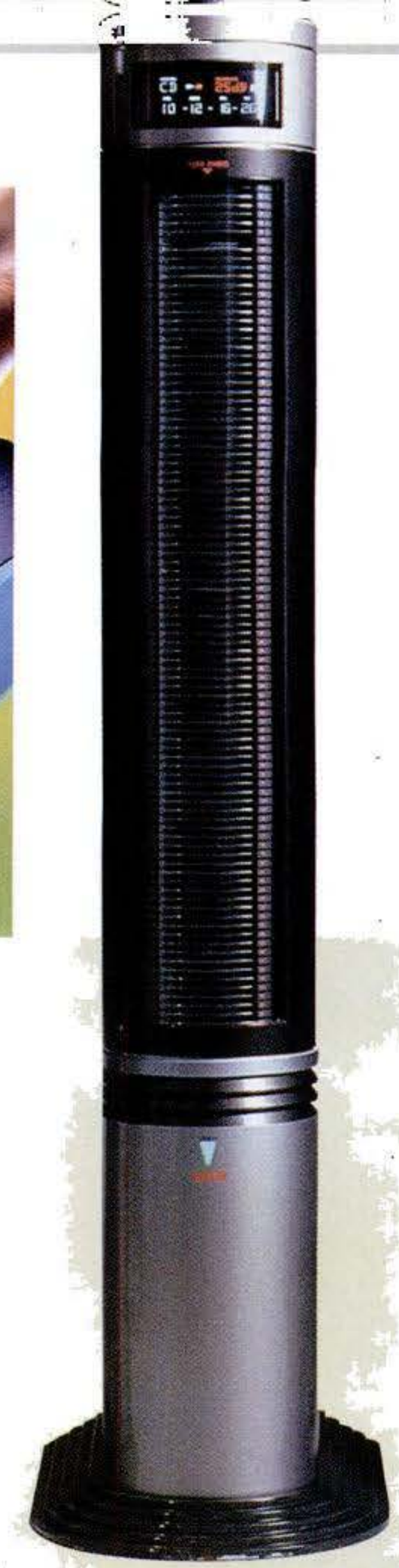
On the level

NEED TO make some accurate measurements? The LeveLite SLX projects level and plumb with laser beams. It can also send two lines of light straight out the sides, to function as a carpenter's square. Price: about $400. LeveLite Technology, 1340 Space Pkwy., Mt. View CA 94043.



Titanium Crowbar

RUSSIA, WHICH possesses abundant supplies of titanium, leads the world in manufacturing with the light ultra-hard metal. Even *crowbars* are made out of the stuff. A sturdy bar 22 inches long weighs just two pounds and may be passed from generation to generation in a family, like a piece of indestructible furniture. Price: $30. U.S. Cavalry, 2855 Centennial Ave., Dept. RE 1795, Radcliff KY 40160-9000.



Jukebox of the Future

DIGITAL VIDEO Discs—which will fit an entire movie on one compact disc—are expected next year. But TV manufacturers are already designing concept players. One from RCA Thomson Consumer Electronics (photo) stores movies in a 100-disc "elevator." Any title would be ready to play by pressing buttons on a remote; you could also categorize titles by theme or your favorites.

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NEWSFRONTS

ELECTRONICS

EDITED BY MICHAEL ANTONOFF

R & D

3-D TV Without Glasses

FORGET THOSE red-and-blue tinted cardboard glasses or electronic shutter goggles. HinesLab Inc., of Glendale, California, has developed a video-display system that conveys a convincing illusion of three-dimensional depth to viewers, without the encumbrance of eyewear.

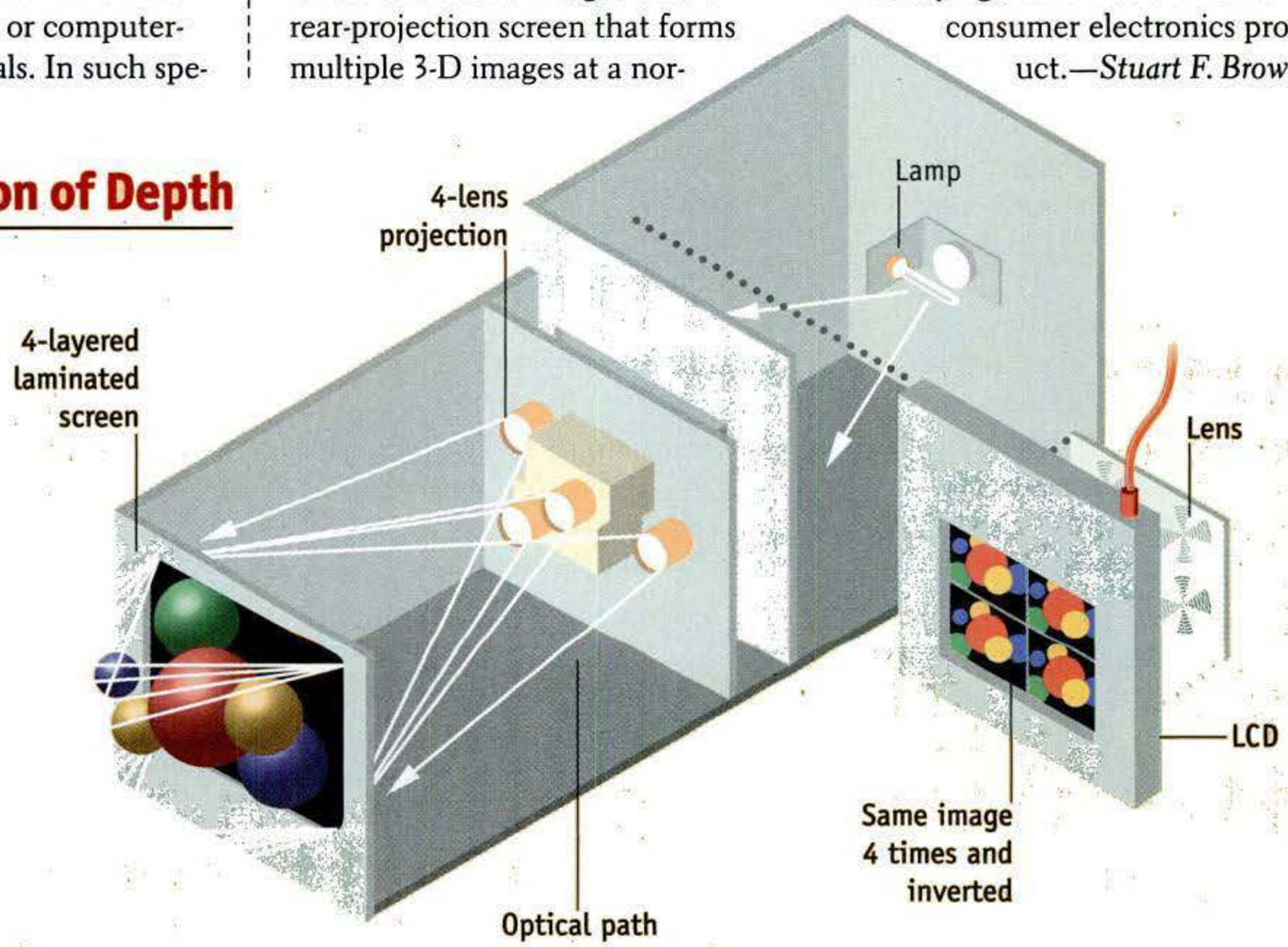
Early uses for the system are likely to be arcade games and specialized displays such as air-traffic-control workstations or computer-aided-design terminals. In such specialty displays, the addition of depth perception could reduce human error and stress by making the location of objects much easier to see. Since the components are relatively inexpensive, personal computers are also candidates for 3-D displays.

The HinesLab 3DTV system uses a color liquid-crystal screen on which four images photographed from slightly different angles are displayed. A system of mirrors and lenses directs the images onto a rear-projection screen that forms multiple 3-D images at a normal viewing distance in front of the monitor. Nearer and farther objects appear to move relative to each other when the viewer shifts his head from side to side.

So, when will images start leaping out of your living room TV? "That's a chicken-and-egg problem," says inventor Stephen Hines, a former Eastman Kodak researcher who has also developed 3-D movie cameras for Disney Studios. "New 3-D programming needs to be shot using special multi-lens, multi-recorder video cameras, and broadcast to a new generation of 3-D TV sets." Although the total investment needed would be large, major manufacturers such as Sanyo and Sharp are studying 3-D TV as a next-wave consumer electronics product.—*Stuart F. Brown*

ALEX REARDON

The Illusion of Depth



The HinesLab 3DTV system uses a color liquid-crystal screen on which four images photographed from slightly different angles are displayed. Mirrors and lenses direct the images onto a rear-projection screen that forms multiple 3-D images at a normal viewing distance in front of the monitor.

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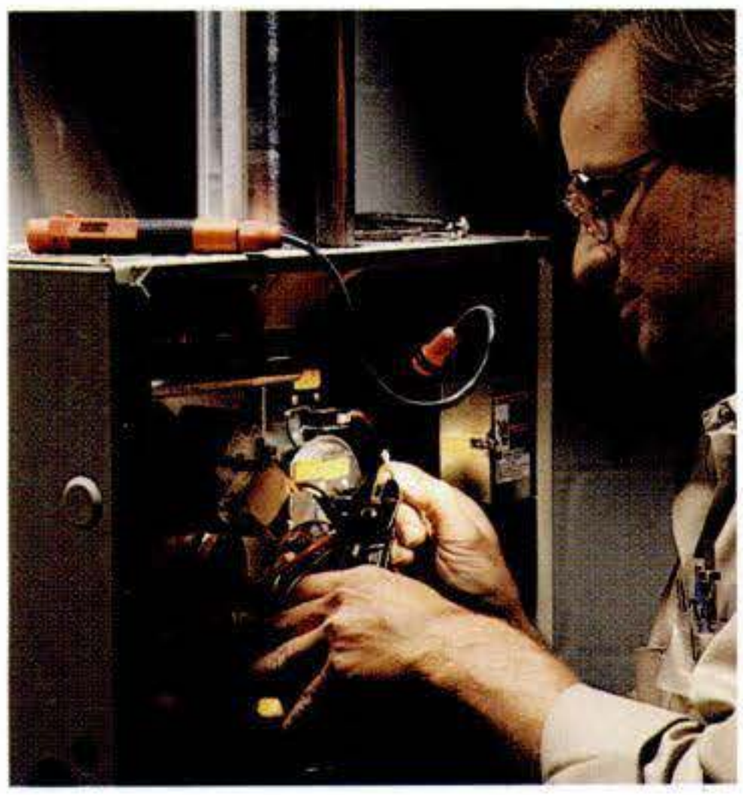

It's cold outside and you have a furnace to fix. It's waiting for you in a dark basement or utility closet. Make the job easier with the right tools—including the right light.

You need the 2AA Flexible Head Inspectors Light from Powermate, because you want good light in the right place, which you can't always get with an ordinary flashlight.

The Powermate Inspectors Light lets you position the light and bend the flexible head to direct light exactly where it's needed. Now, even in the tightest, most awkward spaces, you're ready to work with both hands free.

The Inspectors Light features an all-weather EnduraTex™ grip, an 8-inch flexible neck, a bright-white premium bulb and a shatter-resistant lens.

Like all the 24 new lighting tools from Powermate, the Inspectors Light is rugged, reliable and built to construction-grade standards. Powermate lights, a new line from The Coleman Company, are available at home centers, building supply and hardware stores nationwide.

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RADAR DETECTORS

Alerting Drivers to Roadside Hazards

SOME NEW radar detectors do more than warn motorists about speed traps. Safety Alert radar/laser detectors also signal drivers about approaching emergency vehicles and road hazards.

The detectors receive signals from Safety Alert transmitters that have been installed at construction sites; by municipalities on their police cars, fire trucks, or ambulances; or by railroad companies on their trains. The transmitters, made by defense contractor Alpha Industries, broadcast in the same frequency as K-band radar and trigger a car's radar detector from up to three-quarters of a mile away. Detectors from Cobra Electronics Corp. and Cincinnati Microwave go one step further and emit a unique tone while displaying the hazard.

When a speeding police car approaches, for example, the words "emergency vehicle" appear on the liquid-crystal display of Cobra's model RDL712SW detector ($179). There are specific messages for road construction or an approaching train. The RD216SWS ($149) and cordless RD8000SWS ($199) employ a five-LED display. The Passport 5000 ($179) from Cincinnati Microwave is another Safety Alert detector that displays hazards on its LCD.

Bell, Whistler, and Uniden have models that pick up the Safety Alert signal and emit a different tone than that used to identify a radar gun. Though the tone isn't specific, it would likely make drivers slow down.

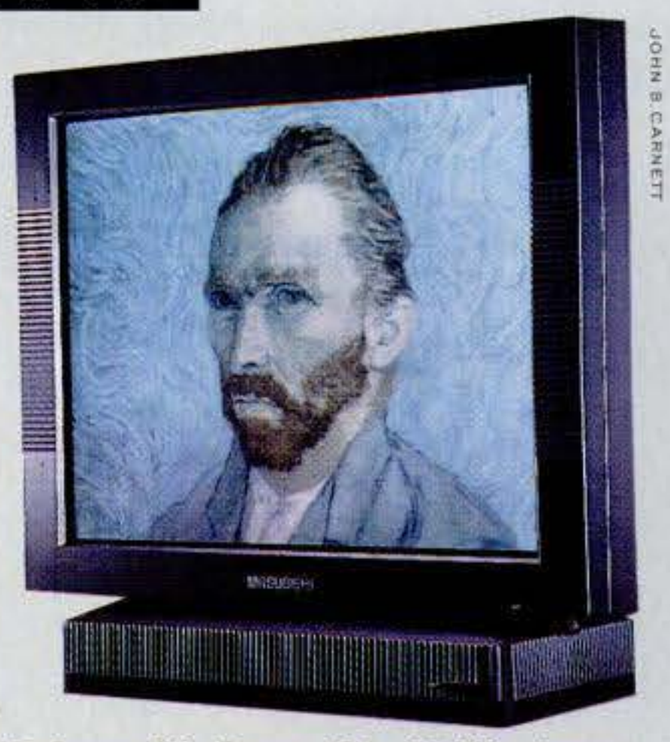
Municipalities in more than 30 states use the Safety Alert transmitter. To find out if it's active in your area, call Cobra at 312-889-8870.
—*Suzanne Kantra Kirschner*

PLASMA TV

Finally, Flat TVs?

THE PLASMA display panel now seems to be the most likely technology to occupy a place on the living room walls of the well-heeled in a few years. Japanese electronics giants Matsushita, Fujitsu, and Mitsubishi have recently demonstrated flat panels that exhibit a crisp picture, bright colors, and a wide viewing angle. Gone are the droplet effects seen in gas-plasma panels of two years ago, which made watching TV akin to peering through a fog.

Mitsubishi showed a working 20-inch prototype in New York this past September that was attached to a laser disc player. About 3 inches thick, the panel contained fans to vent heat through the back. The panel was fixed to a heavy, foot-deep base that housed the power supply. Mitsubishi officials say that when the display ships in 1997, the panel will be tethered to heavier components by a cable, so it can hang on a wall.



JOHN B. CARNETT

Between TV shows, Mitsubishi's plasma TV set might exhibit works of art.

Mitsubishi says that although a 20-inch display makes good sense for computer-assisted-design applications, models that are designed as televisions will measure 40 inches. The price is expected to be in the $8,000 to $10,000 range.—*M.A.*

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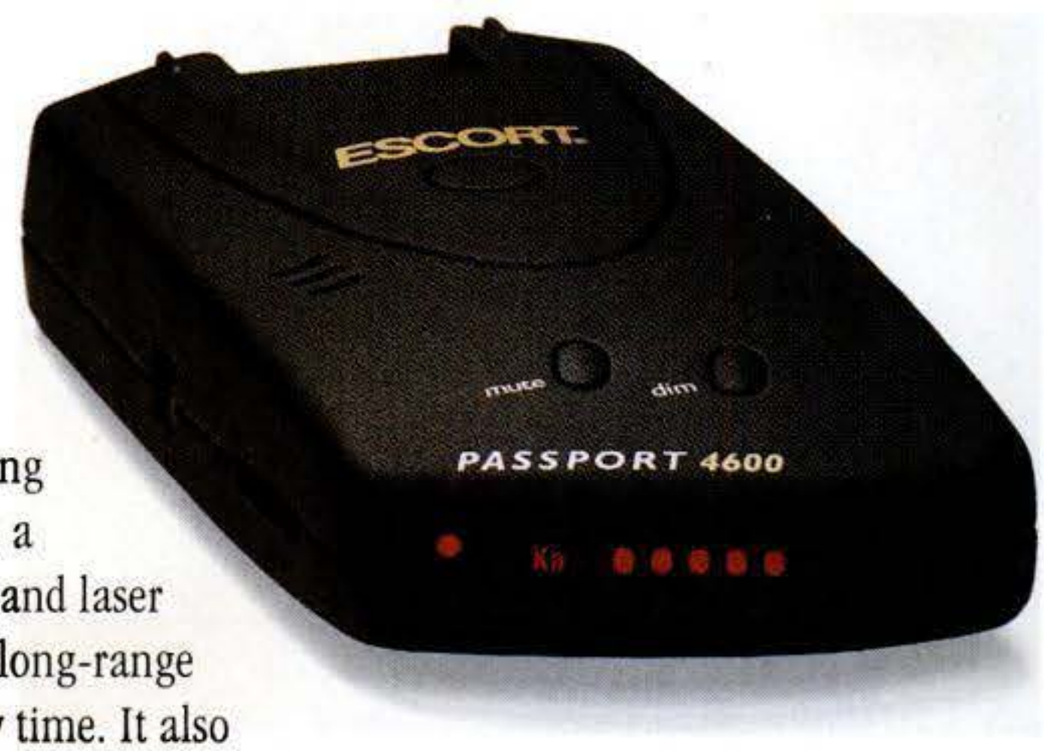
"Passport 4600 is the best detector Escort has ever designed."



"I've worked at Escort for seven years now and have been involved in the design of a lot of great detectors and I can truthfully say, Passport 4600 is the best we've ever designed.

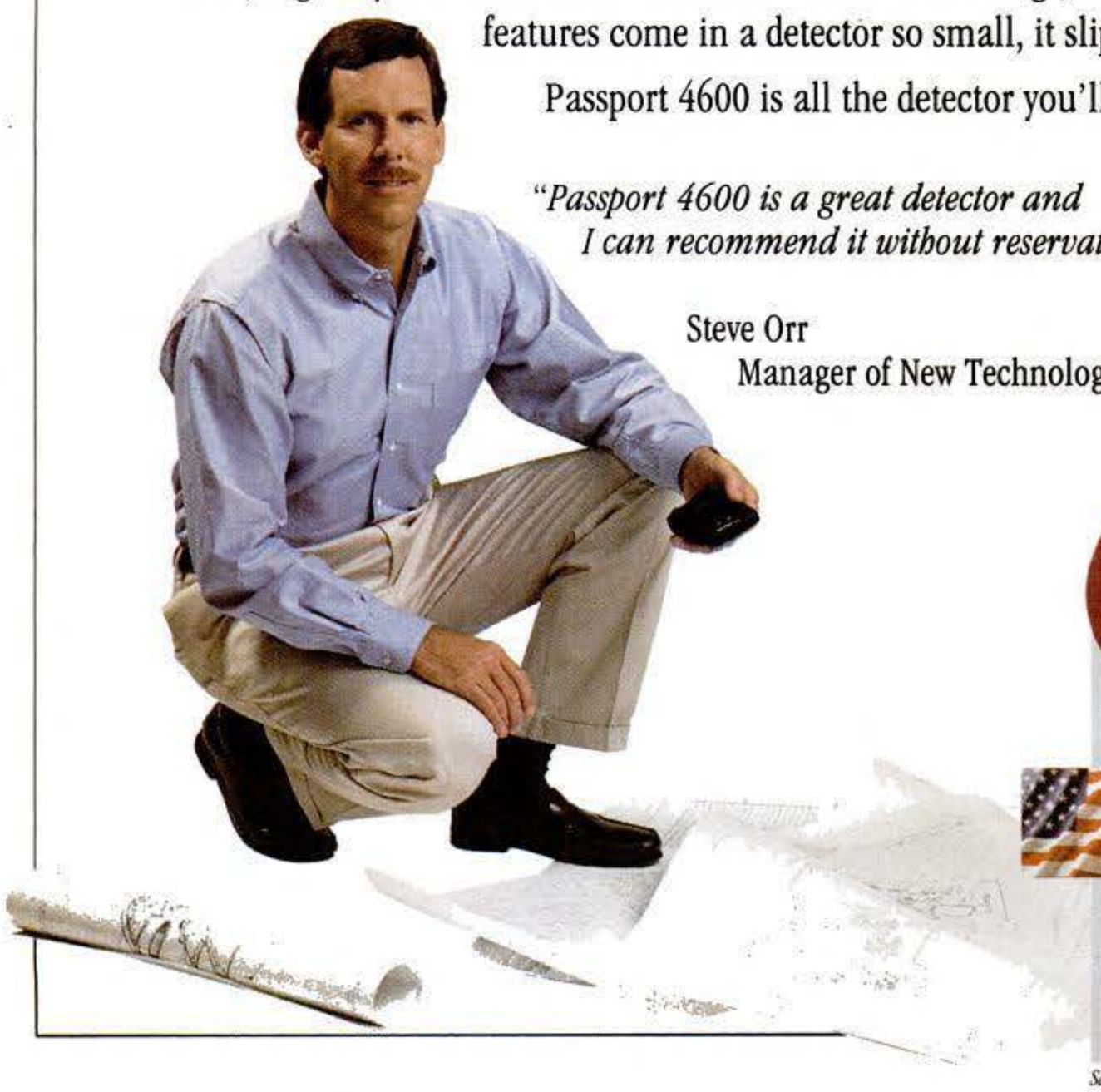
Passport 4600 has the best warning distance we've ever achieved in a detector – on both radar and laser bands. You're assured of long-range warning on all radar and laser bands every time. It also includes a front and rear laser lens. Since laser signals are inherently more difficult to detect, dual lenses provide the most laser protection possible.

We used some neat techniques in software design to identify real traffic radar signals from non-traffic radar. The result is the smartest solution to the detector falsing problem ever developed. Falsing is significantly reduced on all radar bands.

Passport 4600 also includes SafetyPilot™ technology to detect Safety Alert™ transmitters (Safety Alert™ warns you of approaching driving hazards such as speeding emergency vehicles, accident sites, highway construction or unmarked railroad crossings). Best of all, this great design and these neat features come in a detector so small, it slips easily into a shirt pocket.

Passport 4600 is all the detector you'll ever want."

Installment billing available!
Make just 4 monthly payments of $44.99. Call for complete details.



"Passport 4600 is a great detector and I can recommend it without reservation."

Steve Orr
Manager of New Technology

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AUTOMOTIVE

EDITED BY DAN McCOSH

Ford's new F-150 pickup has a higher payload, more horsepower, and improved fuel economy.

NEW MODELS

Ford's F-150 Pickup Goes High Tech

FORD'S NEW F-150, launched as a 1987 model at the beginning of 1986, is designed to build on truck basics like payload and power, while improving fuel economy and driver comfort—areas that haven't often been in the mainstream of light truck engineering. Critics have noted recently that light truck fuel economy offsets some of the gains made in passenger cars as more trucks displace passenger cars in the national fleet.

The new F-150 is several hundred pounds lighter than Ford's previous generation of pickups, despite being larger, more rigid, and with a higher payload and base horsepower. This results from a combination of careful structural analysis, a lighter drivetrain, and the innovative use of aluminum in the hood. The latter component alone saves about 25 pounds—enough to compensate for the added weight of gas struts that prop the hood, rather than the conventional prop rod.

The new body style includes a standard one-side rear door on supercab bodies, making it simple to get passengers or cargo in and out of the rear compartment. Interlocks prevent accidental opening.

The new F-series brings overhead-cam engine design to domestic pickups. The new engines include a 205-hp V6 and a 210-hp 4.6-liter V8. Later, a 5.4-liter V8 will be added to the lineup, and next year, a V10 will become available in some F-series models. The increased efficiency of the new engines translates into better fuel economy. Although this is not finalized, estimates for improvement range between two and four miles per gallon.

The new double-A-arm suspension vastly improves steering precision, demonstrated in an impromptu slalom. The rear suspension relies on angled leaf springs to provide remarkably finessed ride and handling, better than what you'll get in many passenger cars, despite the increased payload.—*D.M.*

FUTURE CARS

Audi Thinks Small and Fast with TT Concept

CONCEPT CARS are mainly exciting exercises in what could be; they are even more exciting when there's a possibility they'll make it into production. That possibility gave this little Audi hot rod show-stopper status last fall at the Frankfurt and Tokyo auto shows.

Designed as both a coupe (TT) and a convertible (TR), these tidy 2+2 designs draw on Audi's glorious past—including the Auto Union Grand Prix cars of the late '30s—and add a needed dose of adrenaline to Audi's slightly stodgy image.

Both the TT and TR are based on the floorpan of the Audi A3, a new subcompact not due until this summer. Overall, they're not much larger than a Mazda Miata. The A3 wheelbase was shortened slightly (to 95.6 inches) to provide a foundation for the show cars, but the mechanicals—drive system, suspension, and the A4's 150-horsepower, 1.8-liter 20-valve turbocharged four-cylinder engine—are straight from the Audi parts bin. Using available components enhances the prospect of production considerably.

With a curb weight in the vicinity of 2,700 pounds, 150 hp yields a respectable power-to-weight ratio. Audi projects a top speed of about 140 mph. And the shape, judged the best concept at the Frankfurt show, looks like a winner, topless or not.

Spurred in some measure by the new roadsters due from BMW and Mercedes-Benz, Audi could have production versions of the TT and the TR ready to roll for the 1998 model year.—*Tony Swan*

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SPEED

This RX-7 failed to hit the elusive 300 mph mark, but took home a speed record.

Salt Flats Record

WHAT DOES IT take to land on the cover of POPULAR SCIENCE? In the case of one Mazda RX-7, the qualifying maneuver was a 230-mph spinout and somersault ending with an oil fire [see "Bonneville Salt Flats: Quest for Speed," April '93]. Jim Mederer, the car's driver, rode out this mishap three years ago on the Bonneville Salt Flats while attempting to set the first speed record over 300 mph in a production-based automobile. Thankfully, Mederer wasn't injured. Nor was his determination to rebuild his car and try again.

Mederer is co-owner of Racing Beat, the California rotary-engine-tuning firm that built this star-crossed RX-7 with Mazda's backing. Wearing fresh sheet metal—this time painted black instead of white—Racing Beat's RX-7 returned to blitz the salt at 242.005 mph during last summer's Bonneville Speed Week. That was far short of the goal, but good enough to shatter the existing record.

Modifications included a flat carbon-fiber floor pan, custom suspension, racing tires, and a fortified driveline. The RX-7's aerodynamic properties were improved by a lowered ride height and two rear-mounted add-ons: an under-car air extractor and a spoiler. In place of the stock 255-horsepower two-rotor engine, Racing Beat installed a three-rotor Wankel boosted to more than 900 hp by three turbochargers.

Best-laid plans often run awry at Bonneville, where both the weather and the salt's surface are quixotic. Vividly describing his 242-mph experience, Mederer reported, "It was scary—like driving on ice." Unfortunately, he hit an invisible wall at that speed and was unable to accelerate any higher. Mederer concluded that two things will be required to break the 300-mph barrier: wind-tunnel research and far more traction than currently exists at Bonneville.—*D. S.*

SAFETY

Mini Airbag

A MAKER OF military parachute fabrics has joined up with Sandia National Laboratory's parachute research group to develop a new airbag that is 60 percent smaller when folded and 60 percent lighter than conventional airbags [see "Best of What's New," this issue].

The new airbag fits into a man's shirt pocket, yet offers the same protection as conventional designs, which are about the size of two videotapes. It is also easier to manufacture than current airbags, according to Greensboro, N.C.-based Precision Fabrics Group. The new design uses the same triggering and inflation systems as conventional bags.

All automobiles sold in the United States are required by law to have both driver and front-seat-passenger airbags beginning in 1997. The Precision Technology Airbag should make dashboard installations easier, with less room taken from glovebox and storage areas. It could also simplify airbag protection for side impacts and for rear-seat passengers. The new airbag is currently being evaluated by carmakers in Europe and the U.S.—*R.S.*

SUSPENSIONS

Adapting High-Speed Hydraulics

ACTIVE suspensions, which use engine-supplied hydraulic pressure to control wheel travel, have been shelved, including the system offered on the Infiniti Q-45. Meanwhile, Cadillac has been adapting some of the high-speed hydraulics of active suspension to something as simple as a "passive" shock absorber. Now comes the new Continuously Variable Road Sensing Suspension, available on the new 1996 Seville and Deville Concours models. The new shocks use extension sensors to read the vertical acceleration of the wheel as it passes over a bump. An intricate valve continuously alters the flow of fluid in the shock absorber to alter the damping effort independently at each wheel.

Cadillac engineers say the system can alter the fluid pressure in milliseconds, or for every forward inch of travel at 60 mph. On the highway, the system provides a solid combination of chassis control and ride comfort under a wide variety of conditions.—*D.M.*

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SECURITY

Microwave Doppler Foils Thieves

A BRIEFCASE left behind in an open MG-F roadster should be an easy target for thieves. But an alarm sounds instantly if a hand reaches inside to snatch it. Rover's new sports car is protected by microwave Doppler radar that fills the cockpit with radio-frequency (RF) signals even with the top down. Developer Lucas Automotive claims that RF interior sensing has big advantages over ultrasonics, now commonly used.

RF is not affected by air movement inside the car, often due to wind and passing vehicles, which causes the false alarms common with ultrasonic detection. "Most people now ignore car alarms," says Lucas' Mike Peters. "Regaining public faith in alarms could be a major factor in reducing car thefts."

As in the MG-F, the radar beam can be shaped to match the car interior, so it is interrupted only by movement within the passenger compartment, and not by any external activity. Simple installation is another plus: The RF unit can be fitted behind the roof lining or plastic panels, avoiding styling problems. And it needs only one wiring run, rather than the two for the separate transmitter and receiver required for ultrasonics.

Microwave technology also has advantages when used for remote entry systems, in this case when compared with the more typical infrared control. An RF system is nondirectional, so its handheld remote control needn't be pointed at the car's receiver. RF is also unaffected by frosty or misted-up windows and can even be controlled from inside the driver's coat pocket.

The RF unit can be hidden anywhere in the car body. What about "grabber" devices used by crafty thieves to read the entry code and thus unlock the car? Lucas' response is a "rolling" security code that changes every time the system is activated. Attempting to copy the millions of variations is useless.

If all that doesn't foil a determined thief, Lucas has a clever electronic tilt sensor that trips the alarm if the thief tries to lift the car to tow it away, or jack it up to pinch alloy wheels. Unlike other such sensors now in use, this one doesn't react if the car merely rocks in a strong wind or someone sits on the hood. The sensor, a dielectric-filled capacitor in a domed capsule, is controlled by software that responds only to slow, steady upward movement.—*D. Scott*

PREVIEW DRIVE

Hidden improvements in the 1996 Jeep Grand Cherokee provide a smoother, quieter ride.

A Grander Cherokee

THE SUBTLE exterior changes on the 1996 Jeep Grand Cherokee belie the improvements under the skin. Suspension and drivetrain improvements result in a smoother highway ride and greater steering precision. The Grand Cherokee thus follows the trend away from all-out ruggedness in high-price sport utilities.

The Grand Cherokee's new interior includes standard dual airbags and an optional integrated child safety seat in the rear seat. Interior appearance is enchanced by a new console and instrument panel. The horn switch moves to the center of the steering column, where it belongs.

The overall body-stiffening exercise is accompanied by a redesigned four-liter, six-cylinder engine that is smoother and quieter. The base six-cylinder engine is rated at 185 horsepower, with 220 pound-feet of torque. The optional V8 produces 220 hp, with 300 foot-pounds of torque.

Jeep also follows Ford's lead with a new four-wheel-drive system that engages automatically when traction conditions make it desirable [see "Masters of Mobility," Oct. '95]. The new Jeep four-wheel-drive system uses a viscous clutch to engage the front axle—the clutch reacts to spinning rear wheels by transferring power to the front wheels via a series of metal plates running in a thick silicone fluid. The all-mechanical system can be locked into full-time four-wheel drive in low range.

A short drive in the Grand Cherokee reveals a new sense of poise on the road and a vastly improved ride. A full evaluation will appear in the near future.—*D.M.*

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MATERIALS

Weight Watchers

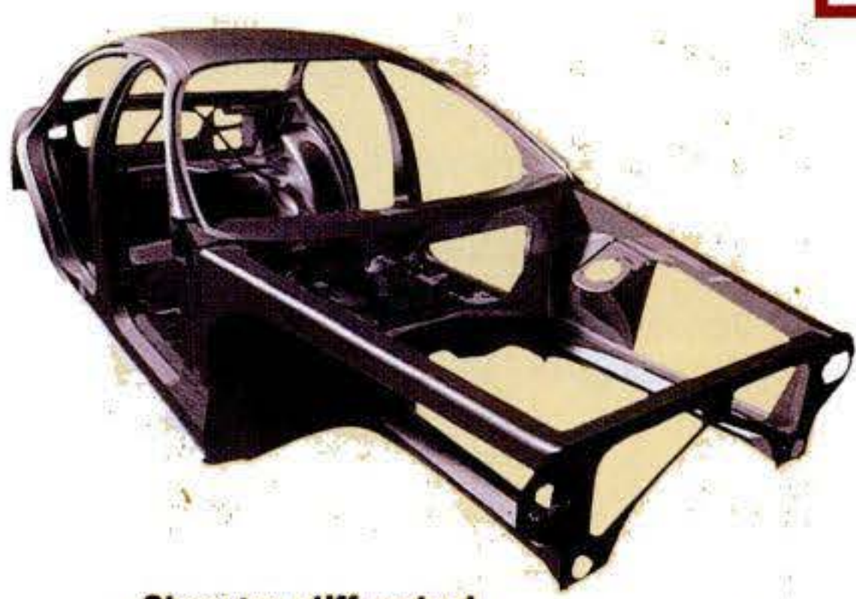
THE SPECTER of today's almost exclusively steel-bodied cars being displaced in the future by cars largely made of composites or aluminum is not something the steel industry is taking lightly. A group of the world's largest steel companies is sponsoring a research effort to cut the weight of today's steel chassis by 30 to 40 percent, and hopes to make it cheaper as well.

The $20 million research project got underway shortly after the federally sponsored Partners for a New Generation Vehicle (PNGV) project team announced last year that it did not consider steel a viable material for the proposed 80-mpg car [see "Emerging Technologies for the Supercar," June '94]. Steel's benefits—mainly low cost, relative ease of manufacturing, and potential for recycling were outweighed, according to PNGV, by what seemed like the end of the road in the development of lightweight structures.

Now research by Porsche Engineering Services seems to indicate that the ultimate potential of an all-steel auto body still has a way to go. An analysis of nine popular sedan bodies by Porsche showed that designing an all-steel body with a "holistic" approach—as an integrated unit—could yield considerable weight savings, plus reduce cost. After several types of construction were investigated, a structure that combined several new manufacturing techniques was developed.

The experimental body combines a unit-body construction made from laser-welded blanks—sheet steel assembled from various thicknesses. Critical structural components are made by "hydroforming"—a technique that involves shaping tubing with hydraulic pressure in a closed die. The combination cuts the weight of the basic body structure by about a third and makes it far stiffer and stronger, as well.

The steel substructure consists only of about a third of the total weight of a car, however, and the effect on the total weight of the vehicle is not as dramatic. Regardless, the new steel coalition intends to develop a running prototype quickly. —*Dan McCosh*



Stronger, stiffer steel body cuts weight by one-third.

PREVIEW DRIVE

JOHN B. CARNETT

A 5-inch stretch creates a loungelike rear seat in this new XJ-series Jaguar Vanden Plas.

The Cat Stretches

ADDING FIVE inches to the 113-inch-wheelbase Jaguar XJ-series sedans almost demands that the driver wear a chauffeur's cap. The stretch adds considerable knee room to the rear seat and creates a panoramic vista through the widened rear side windows for the passengers who lounge in limosine comfort.

The long-wheelbase version was conceived and executed in barely 15 months, something inconceivable in the pre-Ford era, when a 20-year-old Jaguar design was barely past middle age. The extra knee room was, in fact, added with some consideration to chauffeur-driven cars in Europe, but mainly in response to some criticism of the lack of rear-seat room in the new-generation XJ sedans, introduced less than two years ago.

The walnut-trimmed Vanden Plas edition now is available only on the longer wheelbase, powered by a 245-horsepower, 4.0-liter DOHC inline six-cylinder engine with four valves per cylinder. The 6.0-liter 313-hp V12 is optional. The supercharged inline 4.0-liter power plant remains available on the short-wheelbase chassis only as the XJR model.

Despite the slight additional weight, performance is scarcely affected. That makes for an unusually quick and precise driving experience, completely in accord with the standard XJ-series. Additional sound insulation and added window thickness keeps outside sounds outside. The new rear seat has optional heaters, and the rear seat passengers also get a newfound ability to adjust the front passenger seat from the rear, via a panel that also is accessible from the driver's seat. One more thing for the kids to annoy you with.—*D.M.*

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HOME TECHNOLOGY

EDITED BY JUDITH ANNE GUNTHER

This redesigned enzyme, known as subtilisin, may soon help make your laundry whites whiter.

LAUNDRY TECH

Recombinant Detergent

GENETIC ENGINEERING has infiltrated the laundry room. The result could be a detergent that tackles stains more effectively than products on store shelves today.

Scientists are merely making an adjustment to nature's own potent methods for breaking down large organic molecules. A soil bacterium called *Bacillus amyloliquefaciens* excretes an enzyme called subtilisin to digest some of the tougher proteins it encounters. Since the 1960s, detergent makers have added the enzyme to their products to break down dirt and protein-based stains.

Chemical experts who've studied the matter have long known that the full grime-beating powers of subtilisin were not being brought to the battle. The molecule is hindered by the harsh conditions of the laundry; for example, water softeners yank calcium away from the enzyme, causing it to destabilize and become inactive. To prevent this, detergent makers have added expensive chemical stabilizers to their products.

Researchers at the Center for Advanced Research in Biotechnology in Rockville, Maryland, led by structural biologist Philip Bryan and funded in part by detergent giant Procter & Gamble, decided the calcium-binding site was the enzyme's Achilles' heel. Using genetic engineering, they removed the piece of the enzyme where calcium normally binds. Then, by altering the enzyme's molecular structure, the researchers developed a version that was stable enough to withstand the onslaught of water softeners.

Researchers believe the new subtilisin will be inexpensive and easy to engineer. It could be making its way to store shelves within the next two or three years.—*Alan Zibel*

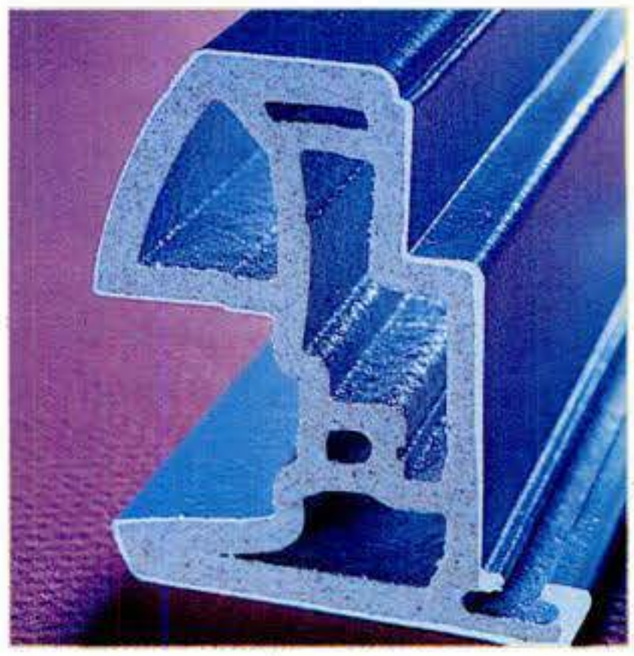
WINDOWS

Sash Panache

GOOD NEWS FOR homeowners: Choices for replacement windows are getting broader. And the latest alternative, from Andersen Windows, is more durable than vinyl and a better insulator than aluminum.

Andersen is using a structural composite material for the sashes and frames of its Renewal line of replacement windows, introduced to the Minneapolis area last summer. Many of the windows currently sold as replacements are made with vinyl, because that material is less expensive than wood to manufacture into custom sizes. Vinyl, however, expands and contracts as the temperature changes. "The stresses of the expansion and contraction will show up as cracks in the corners," says Scott Beske, program manager at Andersen Windows. Andersen's material, called Fibrex, expands and contracts about one-third as much as vinyl, Beske claims.

Made of wood fibers and resin recovered from the company's manufacturing processes, Fibrex is also an insulator, rather than a conductor of heat and cold like aluminum, another material that's commonly used for windows. And because it's extruded, says Beske, Fibrex can be molded into curves or channels for inserting weather-stripping or hardware, for example.—*J.A.G.*



JOHN B. CARNETT

Fibrex: A sturdy new choice for windows.

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UTILITIES

Fancy Features for Ordinary Gas Meters

The ubiquitous gas meter goes high tech.

THAT BULKY GAS meter in your basement would look right at home in a submarine. The cumbersome design makes repair difficult, especially in multifamily houses, where meters are installed in rows.

The Gas Research Institute, in conjunction with Battelle National Laboratories, has developed a solution: a meter that is 60 percent lighter and 35 percent smaller—no bigger than two side-by-side shoe boxes. It is tamper-resistant, features a simpler piping system, and can be installed easily in a small cabinet. The compact gas meter will be manufactured by National Meter in Lancaster, Ohio, and should be available in early 1996.

But petite size isn't all that's new in the world of gas meters. As the planet goes interactive, the gas meter won't be far behind. The Gas Research Institute predicts that within about five years, meters will inform their users when gas rates rise. These money-saving meters may even reduce gas flow during peak demand.

Future meters will be equipped with automatic shut-off valves that help reduce dangerous natural gas leaks during a disaster. Fortunately, this capability already was in place in Japanese meters during the Kobe earthquake last year. American gas companies, in comparison, have resisted shut-off features because of their tendency to be tripped by non-catastrophic impacts, such as jarring from heavy equipment.

After the Kobe quake, the city's meters had to be turned back on manually, an expensive and time-consuming task. To solve this problem, experts are designing sophisticated meters that can be switched on electronically. This feature will also eliminate the need for a gas-company employee to enter your basement when you move into a new house.—*A.Z.*

TRENDS

The Green Scene

JUST HOW FAR will a golfer go to satisfy his urge to putt? Not too far, if the green is in the backyard.

The Home Championship Green is a kit for building a professional-quality green in a nonprofessional setting. In addition to the manual and 20-minute video, the $100 kit comes with a flag, a cup, and enough bent or Bermuda grass seed for a 400-square-foot green. You supply the drainage gravel and tubing, the peat and sand, and the shovel (for digging up your lawn).

Available from Private Home Putting Greens in Brighton, Michigan, the kit provides another form of recreation, too: The company recommends you mow your professional turf daily.—*J.A.G.*

THE INTERNET

Wide World of Faucets

LET'S SAY YOU'RE looking for a special neoclassical-cubist faucet in pink porcelain. If it's out there, you'll likely find it via the Faucet Outlet, a new cyberspace market of bath and kitchen fixtures.

The resource, an offshoot of a mail order catalog by the same name, lists more than 10,000 products, including sinks, toilets, and whirlpool tubs. Its World Wide Web home page (www.faucet.com) also guides users to related information, such as plumbing tips.—*J.A.G.*

Of cyber sinks and World Wide Whirlpools?

SOURCES

At Your Fingertips

HOMEOWNERS serious about using products that help save energy or preserve the environment can locate hard-to-find items in three updated databases. Produced by Iris Communications in Eugene, Oregon, these exhaustive information sources list everything from compact-fluorescent wall sconces to recycled-rubber floor tiles.

The Residential Energy Source Directory contains 1,000 energy-saving products; the Compact Fluorescent Lighting Database lists 5,000 lamps, fixtures, and retrofit kits; and the Resources for Environmental Design Index includes 1,200 low-toxicity or environmentally friendly products and sustainably harvested woods. More than rosters of names and addresses, the databases provide product descriptions, tips on how and where to use the items, and, in the case of the environmental-design guide, the materials used.

The databases can be ordered for $50 each (Windows and Macintosh versions), or bundled into a CD-ROM for $115. The company also plans to put the databases on the Internet's World Wide Web (http://crest.org/iris).—*Charles Wardell*

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SCIENCE & TECHNOLOGY

EDITED BY DAWN STOVER

TRANSPORTATION

A Real Bullet Train

STARS WARS technology developed by Sandia National Laboratories could put the United States into the bullet-train business. Sandia researchers say they can build high-speed trains using coil-gun technology originally intended to launch defensive satellites into orbit at 20 times the speed of sound.

In the original launcher, cylindrical electromagnetic coils form the barrel of a powerful gun. The coils are powered, one after another, to "repel" a metal projectile through the barrel at high speed.

In the new variation on this technology, the train itself is the "bullet," a projectile that rides an electromagnetic wave to reach high speeds rapidly. Sandia researchers have constructed a scale model that reaches a speed of 34 mph in only 12 feet.

Unlike magnetically levitating (maglev) trains, the Sandia train does not require special track equipped with electromagnetic coils. Instead, the locomotive carries its own drive mechanism—a set of electromagnetic propulsion coils powered by an onboard gas turbine engine. These coils repel the train down the track by inducing magnetic fields around the edges of aluminum reaction plates embedded between the rails of a conventional track or built into a ladderlike rail running alongside the track.

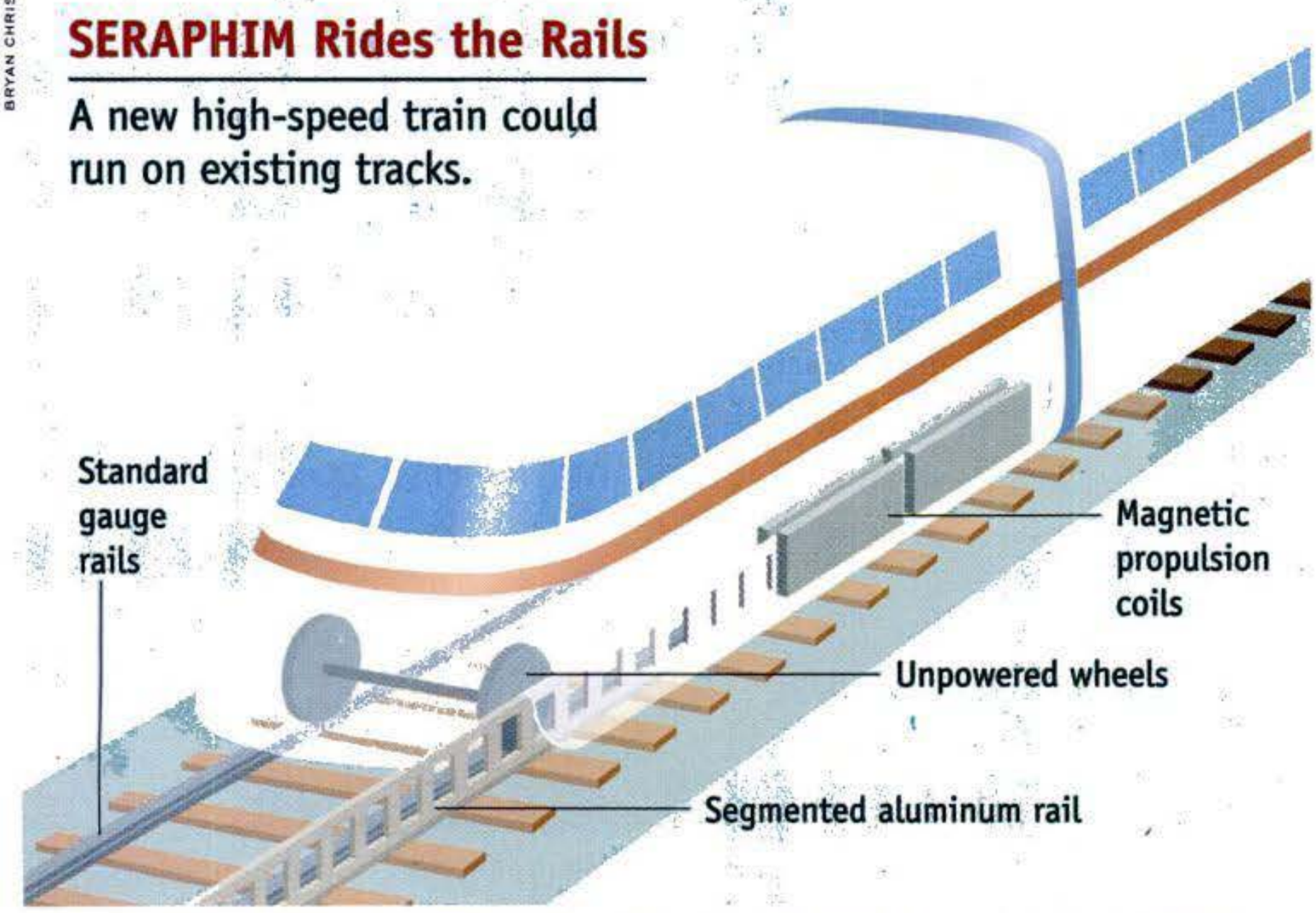
The Sandia high-speed train does not require new rights of way and would be considerably cheaper than the more-complicated maglev trains now being built in Europe and Japan, according to project manager Bob Turman. He says the train could travel at speeds up to 200 mph on existing track.

Sandia researchers are applying to the Federal Railroad Administration for funds to put the program on a fast track.—*Ray Nelson*

BRYAN CHRISTIE

SERAPHIM Rides the Rails

A new high-speed train could run on existing tracks.



The Segmented Rail Phased Induction Motor (Seraphim) train propels itself along an aluminum rail.

GEOLOGY

Upwardly Mobile

AUSTRALIA, the continent down under, is headed for California. The continent is traveling northeast at a geologically brisk pace of two inches a year.

Scientists at the University of Colorado used Global Positioning System satellites to measure Australia's movements over a three-year period. The satellites beam radio signals to receivers in the Pacific and Antarctica, and scientists measure the milliseconds required for them to arrive. Any changes in arrival times of the beams mean the continents are moving.

Australia is put in motion by a rifting zone on the floor of the Indian Ocean, where fresh plumes of magma rise from deep within Earth and force its crustal plates apart. The rift is similar to the mid-Atlantic rifting that is pushing North America and Europe apart.

The satellite measurements provide the first direct evidence of the majestic movements of Earth's tectonic plates, says aerospace engineer Kristine Larson, who led the study. In the past, geologists studied the magnetic signatures of fresh lava on the ocean floor for clues about plate movements.

Despite Australia's relatively rapid progress, it probably won't ever reach the Golden State, Larson says. Another gigantic crustal plate that lies southwest of California will slow and alter Australia's trajectory within a few million years.

Even at its current pace, Australia is a tortoise compared with the Tongan island of Niuatoputapu in the South Pacific. Researchers at the University of Texas at Austin have discovered that the tiny island is the fastest-moving land mass on the planet, traveling at almost 10 inches a year.—*David Graham*

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New Technology Improves Sleep Quality

Chances are, you need better sleep. Thanks to advances in sleep surface technology, now you can get it!

America has become a nation of the chronically sleep-deprived. The Better Sleep Council reports that over the past 20 years, we Americans have added around 158 hours, or nearly an entire month each year, to our job schedules. That's not to mention the time we spend working hard to care for our families and homes. Sleep deprivation is caused by both lack of time spent sleeping and poor quality sleep. Sound familiar? Then you owe it to yourself to read on!

SLEEP DEPRIVATION CAN BE DANGEROUS

According to the AAA Foundation for Traffic Safety, sleep-deprived drivers are vulnerable to "micro-naps" lasting four or five seconds – plenty of time at highway speeds for a fatal crash to occur. Disrupted sleep and sleep disorders cost American businesses billions of dollars annually in lost productivity, industrial accidents and higher medical bills. Lack of sleep also was implicated in the Exxon Valdez oil spill, the space shuttle Challenger disaster and the nuclear accident at Three Mile Island.

Loss of sleep during the night is responsible for increased vulnerability to illness, a tendency to nod off at work the next day, and even loss of creativity and clarity of thinking, say British researchers. Power tools can become dangerous weapons in the hands of someone who is not well rested. And almost everyone is familiar with the physical aches and pains that occur because of poor quality sleep.

DO YOU NEED MORE SLEEP, OR JUST BETTER SLEEP?

On the average, most adults require seven and a half to eight hours of sleep per night, and a full cycle including *deep* sleep is required for us to feel adequately rested in the morning. Any number of factors can interfere with deep, nourishing sleep – including cigarette smoking, worry, a noisy environment and physical discomfort.

Air-cushioned support has been proven to positively affect all three factors that determine the quality of sleep: spinal alignment, pressure points and physiology.

We try remedies from pain medication and sleeping pills, to chiropractic care and self-relaxation techniques in order to get better sleep and rid ourselves of morning aches and pains. But new sleep surface technology offers a simpler solution for many people who toss and turn.

THE FIRST REAL BREAKTHROUGH IN SLEEP SURFACE TECHNOLOGY IN OVER 100 YEARS

Even if you just bought a new bed, you may be sleeping on an antiquated surface! Developed a century ago, innerspring mattresses can create pressure points that interfere with total relaxation. Waterbeds made a big splash in the '60s, but even those labeled "firm" can produce a hammock effect, which can cause the spine to curve unnaturally. Fortunately, a new technology has come through test after test with flying colors: Select Comfort Air Sleep Systems™.

The Select Comfort adjustable firmness mattress uses air which distributes body weight more evenly and provides better support.

While it looks like a traditional mattress on the outside and even fits standard sheet sizes, the Select Comfort mattress is completely unique on the inside. Air is captured inside innovative "I-beam" chambers that contour to the body, provide proper spinal support, reduce pressure points and evenly distribute weight for better sleep.

What's more, each side of the Select Comfort adjustable firmness mattress is independently adjustable – with a remote hand control that digitally tells you the firmness level that's perfect for you. And, you can let air in or out to change the mattress firmness, depending upon how your body feels each night. This is essential for couples, because two people of different shapes and sizes cannot sleep on the same surface and both be as comfortable as they should be to achieve the best possible sleep.

MADE-IN-MINNESOTA QUALITY

Select Comfort adjustable firmness mattresses are manufactured in Minneapolis, Minnesota, and tested for comfort and durability by independent laboratories. Well on its way to becoming a worldwide leader in state-of-the-art sleep systems, Select Comfort currently is the fastest growing company in America's bedding industry, and has earned 22 U.S. patents.

LIGHTWEIGHT AND EASY TO SET UP YOURSELF

The Select Comfort adjustable firmness mattress is so lightweight, it can be delivered via UPS in one carton. Following the simple instructions, one person can set up the system at home, usually in 30 minutes or less. An attached electronic air pump fills the mattress with the right amount of air, and then hides out of sight under the bed. Dual controls allow each sleeping partner to adjust the sleep surface to their desired firmness.

TRY SELECT COMFORT AT NO RISK FOR 90 NIGHTS

Thousands of people from coast to coast already own a Select Comfort adjustable firmness mattress. You can try one, too, protected by a "No-Risk 90 Night" guarantee and up to a 20-year limited product warranty. Call our sleep consultants and ask them about your particular sleep needs. They can answer all your questions and help you better understand how you can benefit from a Select Comfort adjustable firmness mattress.

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Do you toss and turn at night? Can't seem to find a comfortable position? Does your back ache when you awake? These are signs that your metal coil mattress or waterbed isn't supporting you properly and isn't right for your body. Select Comfort can help you sleep better with a revolutionary mattress that's so comfortable and supportive, it's recommended by the many doctors who use our product.

With Select Comfort, you each get exactly the firmness you need.

Select Comfort provides proper back support and contours to your body. Weight is more evenly distributed and pressure points are reduced.

Metal coil mattresses can create pressure points and provide uneven support.

Sleep Better On Air

A Select Comfort adjustable firmness mattress doesn't rely on springs or water. Instead, it supports your body on a cushion of air. Air is better because it gently contours to your body's shape and keeps your spine in its natural alignment. And that lowers the tension in the surrounding muscles. So you can sleep comfortably in any position and wake feeling great!

Select Comfort contours to your body.

You Control The Firmness

With Select Comfort, you can change the firmness depending on how your body feels each night. Go from extra-firm to extra-soft, simply at the touch of a button. In fact, the firmness adjusts independently on each side of the bed so you and your partner can get custom support without compromising comfort or quality of sleep.

Customize the firmness of each side of the mattress.

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You owe it to yourself to learn more about this revolutionary way to a better night's sleep.

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SPACE

Mr. Potato-Head: Future Astronaut?

IN AN UPCOMING test, NASA researchers plan to seal a human subject into a chamber for three months. But the prisoner won't be completely alone; he'll have the company of a large crop of potatoes.

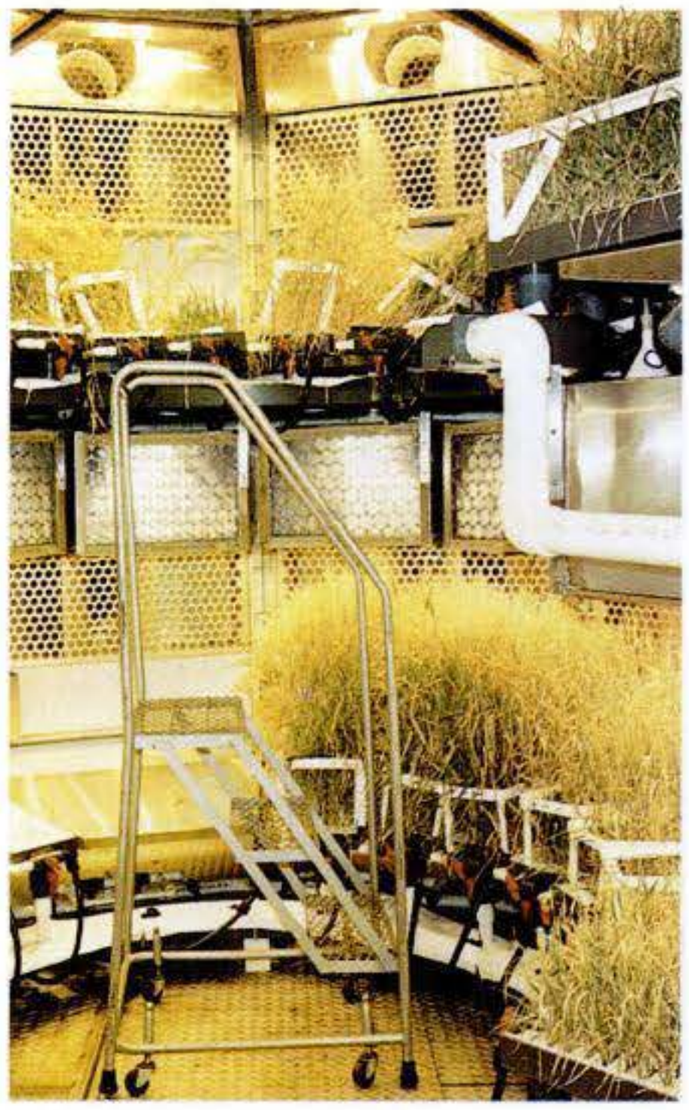
The researchers hope to demonstrate that potatoes can produce oxygen for future space explorers. Says plant physiologist Gary Stutte of NASA's Johnson Space Center: "Our long-range goal is to prove that a plant-based life-support system is as reliable as the mechanical systems found in today's spacecraft."

The researchers are close to doing just that. NASA scientists at Kennedy Space Center recently conducted a 418-day experiment using potato plants in a hydroponic, or water-based, system. Sealed in a 20-foot-long cylindrical chamber that could fit inside the space shuttle's cargo bay, the plants produced four to five times the oxygen required for a mission. The space spuds also produced just over half the food required for one crew member, and converted wastewater into enough purified drinking water to meet the needs of four astronauts.

Eventually, spacecraft or lunar bases would probably use a variety of crops. Potatoes provide the highest yield of oxygen and food, Stutte says, "but wheat is more tolerant to the longer light cycles that might be used in the chamber."

Researchers have found biological life-support systems to be surprisingly flexible. For example, during times of increased physical activity, it is possible to "throttle up" the production of oxygen by increasing light levels.

But how will plants react to microgravity? The October flight of the shuttle *Columbia* carried a University of Wisconsin experiment to study the growth of potatoes in orbit. NASA researchers who are part of the Wisconsin team will use the data to refine their earthbound experiments.—*Michael Carroll*



NASA

Wheat and potatoes: Plants could provide food, water, and oxygen for astronauts.

AVIATION

Megaplane Revealed

BOEING HAS unveiled its design for the C-Wing, a future 800-passenger airliner. It is even more radical than the flying wing designed by McDonnell Douglas as part of the same NASA program [see "Megaplanes," April '95].

The idea behind the C-Wing is to match the aerodynamic efficiency of a flying wing while keeping the wingspan small enough to fit today's airport gates. Boeing team leader John McMasters based the C-Wing on a design by Stanford University aerodynamicist Ilan Kroo. It features drag-reducing vertical winglets—already used on many airplanes—that have been enlarged so that they can be fitted with inward-facing horizontal winglets of their own.

Blended with a flying wing, Kroo's winglets sweep backward to stabilize and control the aircraft as does a conventional tail. Result: Unlike a pure flying wing, the C-Wing can use lift-boosting wing flaps, allowing the wing to be smaller in area and span.

ALEX REARDON

Boeing's megaplane concept combines a flying wing with swept-back winglets.

The C-Wing has cabins in the wing, like the McDonnell Douglas flying wing. But the Boeing designers wanted to avoid a double-deck cabin because of problems with emergency evacuation, so some of the passengers sit in a conventional forward fuselage.

The forward body carries a foreplane, which improves the performance of the flaps and wing at low speeds. Unlike the flying wing, the C-Wing can later be expanded into "stretch" versions. The net result is an efficient 800-seat airliner that takes up little more space at an airport than does a 747.

Do not expect to board the C-Wing on your next trip: The Boeing design contains some variables in the structure of the wingtips and the thick center-section airfoil that require further testing.—*Bill Sweetman*

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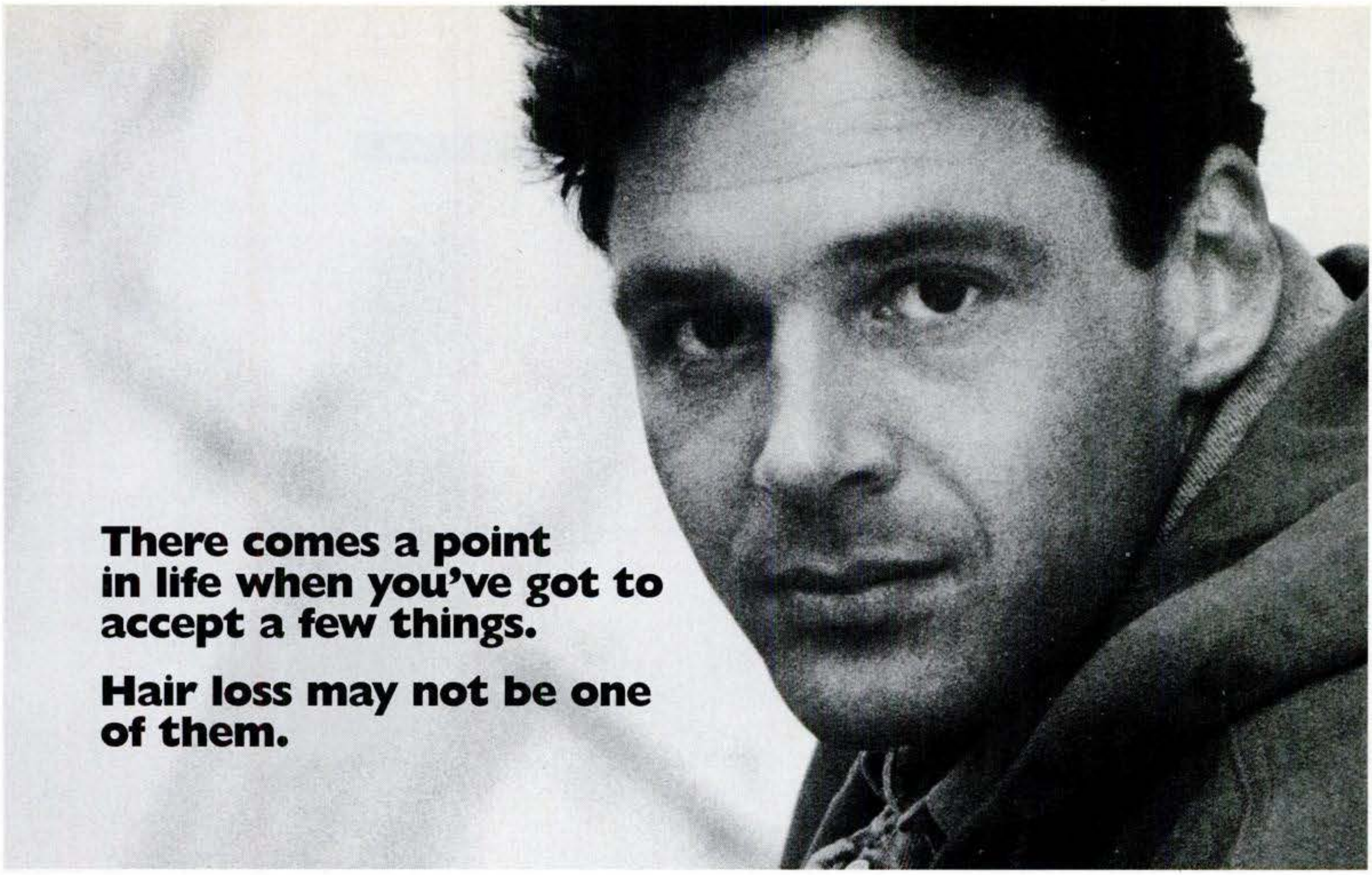

As you get older, there's a lot you've got to accept. But hair loss—why? With all the options available, you don't necessarily have to accept it anymore. But what if toupees, weaves or transplants aren't your style? What if only *regrowing* your own natural hair will do?

Find out about *Rogaine*® Topical Solution (minoxidil topical solution 2%) right now. For male pattern baldness, only *Rogaine* has been medically proven to regrow hair. And taking the first step couldn't be easier. Just call us. We'll have a free Information Kit in the mail to you within 24 hours.

How *Rogaine* works.

The exact mechanism by which minoxidil stimulates hair growth is unknown. But many scientists believe that *Rogaine* works, in part, by taking advantage of the existing hair's growth cycle. Prolong the growth cycle so that more hairs grow longer and thicker at the same time, and you may see improved scalp coverage. Having even a little more hair might make a difference in how you wear and style your hair.

Best of all, if you respond to treatment with *Rogaine*, the change is gradual. Since natural hair grows slowly, over time, you won't get the immediate change in your appearance—or the unwanted attention—of a toupee or a hair weave.

Will *Rogaine* work for you?

Dermatologists conducted 12-month clinical tests. After 4 months, 26% of patients using *Rogaine* reported moderate to dense hair regrowth, compared with 11% of those using a placebo (a similar solution without the active ingredient in *Rogaine*).

After1 year of use, almost half of the men who continued using *Rogaine* rated their regrowth as moderate (40%) to dense (8%). Thirty-six percent reported minimal regrowth. The rest (16%) had no regrowth.

Side effects? About 7% of those who used *Rogaine* had some itching of the scalp. (Roughly 5% of those on the placebo reported the same minor irritations.) *Rogaine* should only be applied to a normal, healthy scalp (not sunburned or irritated).

Make a commitment to see results.

Studies indicate it usually takes *at least 4 months of twice-daily treatment before there is evidence of regrowth.* If you're younger, have been losing your hair for a shorter period of time, and have less initial hair loss, you're more likely to have a better response.

Keep in mind that *Rogaine* is a treatment, not a cure. So further progress is only possible by using it continuously. If you stop using it, you will probably shed your newly regrown hair within a few months. If you respond to *Rogaine*, you'll find it's easy to make it a part of your daily routine.

The facts are free. Plus we'll send you a $10 incentive to see a doctor.

So why act like there's nothing you can do about your hair loss? Call **1-800-608-2255** right now and ask for your confidential free Information Kit. We'll get it in the mail to you immediately. **And since you need a prescription to get *Rogaine*,** we'll also include a list of nearby dermatologists or other doctors experienced in treating hair loss, plus a $10 incentive to visit a doctor soon. It's something you *can* accept... with our compliments.

Call now for your Free Information Kit and a $10 incentive to see a doctor.

1-800-608-2255

Or visit our World Wide Web site at http://www.igroup.com/rogaine

Rogaine® TOPICAL SOLUTION minoxidil 2%

See next page for important additional information.

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Rogaine TOPICAL SOLUTION minoxidil 2%

The only product ever proven to regrow hair.

What is ROGAINE?
ROGAINE Topical Solution is a prescription medicine for use on the scalp that is used to treat a type of hair loss in men and women known as androgenetic alopecia: hair loss of the scalp vertex (top or crown of the head) in men and diffuse hair loss or thinning of the front and top of the scalp in women. ROGAINE is a topical form of minoxidil, for use on the scalp.

How effective is ROGAINE?
In men: Clinical studies with ROGAINE of over 2,300 men with male pattern baldness involving the top (vertex) of the head were conducted by physicians in 27 US medical centers. Based on patient evaluations of regrowth at the end of 4 months, 26% of the patients using ROGAINE had moderate to dense hair regrowth compared with 11% who used a placebo treatment (no active ingredient). No regrowth was reported by 41% of those using ROGAINE and 58% of those using a placebo. By the end of 1 year, 48% of those who continued to use ROGAINE rated their hair growth as moderate or better.
In women: A clinical study of women with hair loss was conducted by doctors in 11 US medical centers. Based on patients' self-ratings of regrowth after 32 weeks, 59% of the women using ROGAINE rated their hair regrowth as moderate (19%) or minimal (40%). For comparison, 40% of the women using placebo (no active ingredient) rated their hair regrowth as moderate (7%) or minimal (33%). No regrowth was reported by 41% of the group using ROGAINE and 60% of the group using placebo.

How soon can I expect results from using ROGAINE?
Studies show that the response time to ROGAINE may differ greatly from one person to another. A temporary increase in hair shedding may occur 2 to 6 weeks after starting treatment with ROGAINE as some hair follicles shift from the resting phase to the growth phase (as new hair growth begins, old hairs are released). An increase in shedding should not last more than a few weeks. If it does, your physician will need to rule out other causes. Successful hair regrowth can only be evaluated after continuous, twice-daily treatment for 4 months or longer.

How long do I need to use ROGAINE?
ROGAINE is a hair-loss treatment, not a cure. If you have new hair growth, you will need to continue using ROGAINE to keep or increase hair regrowth. If you do not begin to show new hair growth with ROGAINE after a reasonable period (at least 4 months), your doctor may advise you to discontinue using ROGAINE.

What happens if I stop using ROGAINE? Will I keep the new hair?
Probably not. People have reported that new hair growth was shed after they stopped using ROGAINE.

How much ROGAINE should I use?
You should apply a 1-mL dose of ROGAINE twice a day to your clean dry scalp, once in the morning and once at night before bedtime. Wash your hands after use if your fingers are used to apply ROGAINE. ROGAINE must remain on the scalp for at least 4 hours to ensure penetration into the scalp. Do not wash your hair for at least 4 hours after applying it. If you wash your hair before applying ROGAINE, be sure your scalp and hair are dry when you apply it. *Please refer to the Instructions for Use* in the package.

What if I miss a dose or forget to use ROGAINE?
Do not try to make up for missed applications of ROGAINE. You should restart your twice-daily doses and return to your usual schedule.

What are the most common side effects reported in clinical studies with ROGAINE?
Itching and other skin irritations of the treated scalp area were the most common side effects directly linked to ROGAINE in clinical studies. About 7 of every 100 people who used ROGAINE (7%) had these complaints.

Other side effects, including light-headedness, dizziness, and headaches, were reported both by people using ROGAINE and by those using the placebo solution with no minoxidil. You should ask your doctor to discuss side effects of ROGAINE with you.

People who are extra sensitive or allergic to minoxidil, propylene glycol, or ethanol should not use ROGAINE.

ROGAINE Topical Solution contains alcohol, which could cause burning or irritation of the eyes or sensitive skin areas. If ROGAINE accidentally gets into these areas, rinse the area with large amounts of cool tap water. Contact your doctor if the irritation does not go away.

What are some of the side effects people have reported?
ROGAINE was used by 3,857 patients (347 females) in placebo-controlled clinical trials. Except for dermatologic events (involving the skin), no individual reaction or reactions grouped by body systems appeared to be more common in the minoxidil-treated patients than in placebo-treated patients.

Dermatologic: irritant or allergic contact dermatitis – 7.36%; **Respiratory:** bronchitis, upper respiratory infection, sinusitis – 7.16%; **Gastrointestinal:** diarrhea, nausea, vomiting – 4.33%; **Neurologic:** headache, dizziness, faintness, light-headedness – 3.42%; **Musculoskeletal:** fractures, back pain, tendinitis, aches and pains – 2.59%; **Cardiovascular:** edema, chest pain, blood pressure increases/decreases, palpitations, pulse rate increases/decreases – 1.53%; **Allergic:** nonspecific allergic reactions, hives, allergic rhinitis, facial swelling, and sensitivity – 1.27%; **Metabolic-Nutritional:** edema, weight gain – 1.24%; **Special Senses:** conjunctivitis, ear infections, vertigo – 1.17%; **Genital Tract:** prostatitis, epididymitis, vaginitis, vulvitis, vaginal discharge/itching – 0.91%; **Urinary Tract:** urinary tract infections, renal calculi, urethritis – 0.93%; **Endocrine:** menstrual changes, breast symptoms – 0.47%; **Psychiatric:** anxiety, depression, fatigue – 0.36%; **Hematologic:** lymphadenopathy, thrombocytopenia, anemia – 0.31%.

ROGAINE use has been monitored for up to 5 years, and there has been no change in incidence or severity of reported adverse reactions. Additional adverse events have been reported since marketing ROGAINE and include eczema; hypertrichosis (excessive hair growth); local erythema (redness); pruritus (itching); dry skin/scalp flaking; sexual dysfunction; visual disturbances, including decreased visual acuity (clarity); increase in hair loss; and alopecia (hair loss).

Can ROGAINE Topical Solution cause unwanted hair growth?
Facial hair growth has been reported with the use of ROGAINE, particularly by women. The cause is unknown but may be related to continuous, unintentional exposure of the face to the medicine or to hair follicles on the face that are extremely sensitive to very low levels of medicine absorbed from the scalp. To minimize the chances of hair growth on the forehead or temples, wash your hands after applying ROGAINE and be careful not to transfer the medicine from your scalp to other parts of your body.

What are the possible side effects that could affect the heart and circulation when using ROGAINE?
Serious side effects have not been linked to ROGAINE in clinical studies. However, it is possible that they could occur if more than the recommended dose of ROGAINE were applied, because the active ingredient in ROGAINE is the same as that in minoxidil tablets. These effects appear to be dose related, that is, more effects are seen with higher doses.

Because very small amounts of minoxidil reach the blood when the recommended dose of ROGAINE is applied to the scalp, you should know about certain effects that may occur when the tablet form of minoxidil is used to treat high blood pressure. Minoxidil tablets lower blood pressure by relaxing the arteries, an effect called vasodilation. Vasodilation leads to fluid retention and faster heart rate. The following effects have occurred in some patients taking minoxidil tablets for high blood pressure:

Increased heart rate: some patients have reported that their resting heart rate increased by more than 20 beats per minute.

Salt and water retention: weight gain of more than 5 pounds in a short time or swelling of the face, hands, ankles, or stomach area.

Problems breathing: especially when lying down; a result of a buildup of body fluids or fluid around the heart.

Worsening or new attack of angina pectoris: brief, sudden chest pain.

When you apply ROGAINE to normal skin, very little minoxidil is absorbed. You probably will not have the possible effects caused by minoxidil tablets when you use ROGAINE. If, however, you experience any of the possible side effects listed above, stop using ROGAINE and consult your doctor. Any such effects would be most likely if ROGAINE was used on damaged or inflamed skin or in greater than recommended amounts.

In animal studies, minoxidil, in much larger amounts than would be absorbed from topical use (on skin) in people, has caused important heart-structure damage. This kind of damage has not been seen in humans given minoxidil tablets for high blood pressure at effective doses.

What factors may increase the risk of serious side effects with ROGAINE?
People with a known or suspected heart condition or a tendency for heart failure would be at particular risk if increased heart rate or fluid retention were to occur. People with these kinds of heart problems should discuss the possible risks of treatment with their doctor if they choose to use ROGAINE.

ROGAINE should be used only on the balding scalp. Using ROGAINE on other parts of the body may increase minoxidil absorption, which may increase the chances of having side effects. You should not use ROGAINE if your scalp is irritated or sunburned, and you should not use it if you are using other skin treatments on your scalp.

Can people with high blood pressure use ROGAINE?
Most people with high blood pressure, including those taking high blood pressure medicine, can use ROGAINE but should be monitored closely by their doctor. Patients taking a blood pressure medicine called guanethidine should not use ROGAINE.

Should any precautions be followed?
People who use ROGAINE should see their doctor 1 month after starting ROGAINE and at least every 6 months thereafter. Stop using ROGAINE if any of the following occur: salt and water retention, problems breathing, faster heart rate, or chest pains.

Do not use ROGAINE if you are using other drugs applied to the scalp such as corticosteroids, retinoids, petrolatum, or agents that might increase absorption through the skin. ROGAINE is for use on the scalp only. Each 1 mL of solution contains 20 mg minoxidil, and accidental ingestion could cause unwanted effects.

Are there special precautions for women?
Pregnant women and nursing mothers should not use ROGAINE. Also, its effects on women during labor and delivery are not known. Efficacy in postmenopausal women has not been studied. Studies show the use of ROGAINE will not affect menstrual cycle length, amount of flow, or duration of the menstrual period. Discontinue using ROGAINE and consult your doctor as soon as possible if your menstrual period does not occur at the expected time.

Can ROGAINE be used by children?
No, the safety and effectiveness of ROGAINE has not been tested in people under age 18.

Caution: Federal law prohibits dispensing without a prescription. You must see a doctor to receive a prescription.

The Upjohn Company, Kalamazoo, MI 49001, USA CB-6-S

MATERIALS

Making Concrete on the Moon

ALTHOUGH CONCRETE isn't a "space-age" material, it might be a good choice for constructing buildings on the moon. That's the belief of Master Builders Inc., a Cleveland-based company that provided funding for a concrete mixer built by students at the University of Alabama at Huntsville and flown on the shuttle *Endeavour* last year. The experiment proved that not only can concrete be made in space, it can be made better than here on Earth.

Before the experiment, scientists didn't know whether water and cement particles would combine in microgravity. They did, but the resulting mixture doesn't look like normal concrete. It has no air voids, so it is stronger than a reference sample mixed on Earth. The space concrete also lacks the capillary channels created when water rises to the top of concrete poured on Earth. Such channels can later allow corrosive salts to leach into the concrete.

Mark Bury, a product manager at Master Builders, offers an explanation for the absence of capillary channels: Water doesn't rise through the concrete because there is no "up" in space. But he says researchers still don't know why space concrete has no air voids.

Astronauts or colonists might someday use materials mined on the moon to make concrete in the low-gravity environment there. But even before that happens, the shuttle experiment may provide clues about how to make better concrete on Earth.—*Ted Scala*

CHEMISTRY

Taking Bomb Makers to the Cleaners

HERB FUNSTEN and Dave McComas, physicists at Los Alamos National Laboratory, normally design sensors for satellites. But last December, working in their spare time, they began developing a "bomb sniffer" that detects explosive materials.

People who handle explosives almost always get trace amounts of residue on themselves and their property. The device invented by Funsten and McComas can detect this residue on clothing, luggage, packages, or the interior of a vehicle.

The device uses a small vacuum cleaner to suck up debris particles, then heats them to 500°C on a fine screen. At this temperature, even microscopic specks of explosive material burn with a quick, bright flash. But ordinary materials such as dust, paper, or hair merely smolder.

In the prototype device built by Funsten and McComas, a photomultiplier tube registers the tiny flares emitted by any burning bits of explosive material, and a computer analyzes the light signals from the photomultiplier. The physicists have demonstrated that the device can detect gunpowder, found in almost half of all homemade bombs.

Will the system be able to spot other explosives? Yes, says McComas, because all are designed to release a lot of energy in a short time. And all are sticky, so they easily contaminate surfaces. He and Funsten are now experimenting with other explosives, including ammonium nitrate, which is used in fertilizer bombs.

The two physicists predict that commercially manufactured explosive detectors could be ready in a year or two. Large units could monitor airport baggage and postal packages on conveyor belts, while handheld units could be used to check people at building entrances.—*R.N.*

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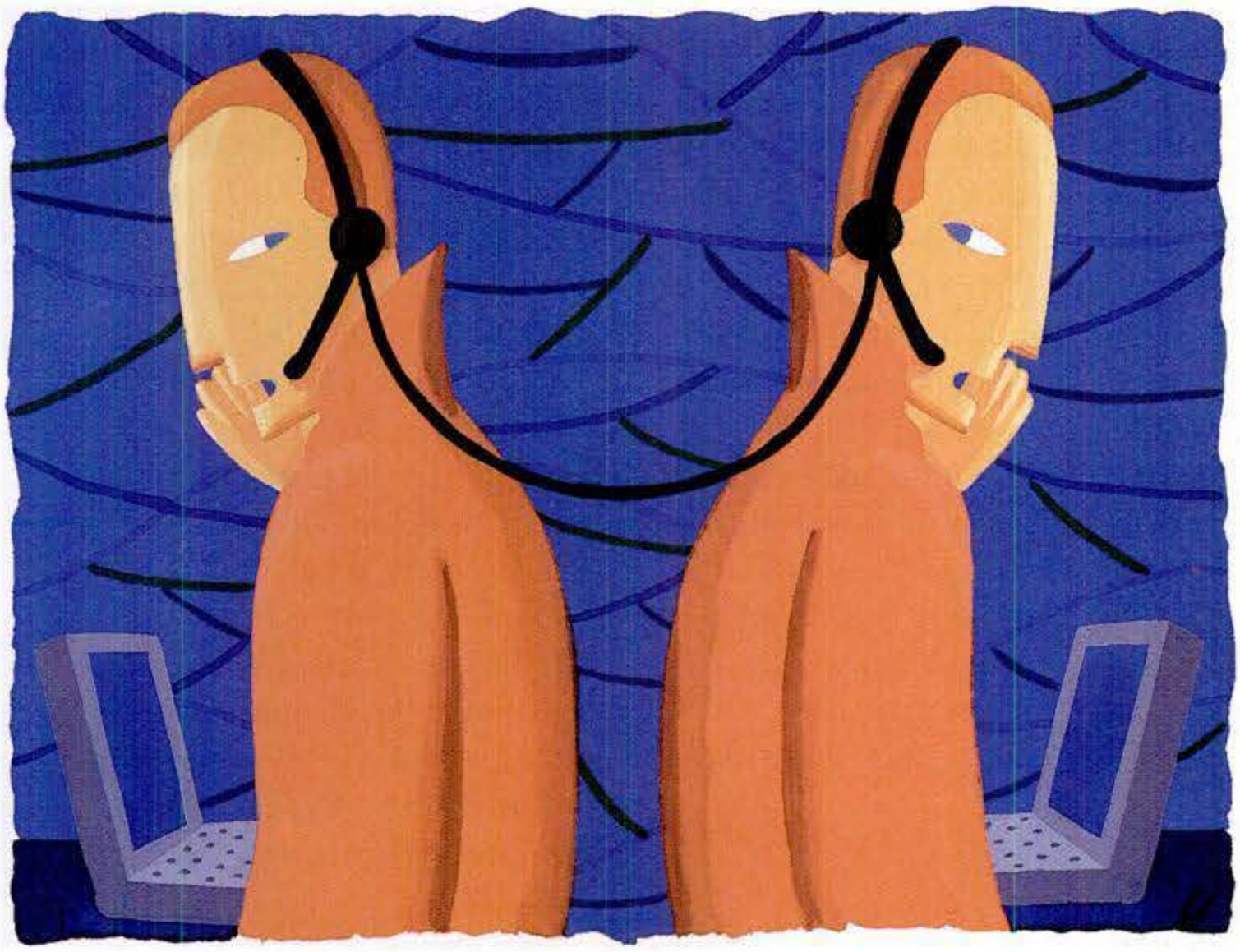
COMPUTERS & SOFTWARE

EDITED BY CHRIS O'MALLEY



DAN YACCARINO

ONLINE

Private Numbers

WHETHER YOU'RE planning a family reunion or something a little less wholesome, you probably want your phone calls to be private. But scrambling telephones can cost $1,000 or more. Now you can get less-expensive, presidential-type privacy via your PC modem.

Philip Zimmermann, a Colorado programmer best known for the powerful encryption scheme called Pretty Good Privacy, or PGP, has developed new software called PGPfone that lets you converse with total privacy over ordinary phone lines. And he's giving it away on the Internet, through MIT's World Wide Web site (http://web.mit.edu/network/pgpfone/). PGPfone is available now for the Macintosh; a Windows version is scheduled to be ready soon.

When used at both ends of the line, PGPfone offers a level of phone privacy long available only to government officials. After the modem dials the number you enter, the human voice is sampled and digitized. Then the PCs "shake hands" and jointly agree on a complex number that is plugged into another equation. This notoriously complex scrambling algorithm, called Blowfish, recalculates the ones and zeros of the voices into a stream of numbers unintelligible even to highly sophisticated eavesdroppers. Finally, PGPfone unscrambles the stream to provide intelligible—though not great quality—sound. There is a delay of about a second, so it may be hard to tell jokes using PGPfone.

It's unlikely law enforcement officials will be laughing. The Federal Bureau of Investigation is especially concerned about advances in encryption software, and PGPfone could become Exhibit A in its case for banning public access to codes that policing authorities can't break. Even the manual warns: "PGPfone is a very political piece of software." —*Mark Uehling*

WEB WATCH

Our monthly filter of what's worthwhile and weird on the Internet's World Wide Web.

Cracks in the Web
http://www.directnet.com/~gmorris/title.html
Every week is a new chapter in this espionage thriller.

CyberTown
http://www.directnet.com/cybertown/
A tourist map of the online community.

Yuckiest Site
http://www.nj.com/yucky
First in a series: More than you ever wanted to know about how cockroaches spend their days.

Telemedicine Web Site Directory
http://www.matmo.army.mil/pages/operations/operations.html
Boning up on bones? Many of the medicine-related web sites are here.

WebAble!
http://www.webable.com/
A guide to the Web for people with disabilities.

Gender-Free Pronoun FAQ
http://www.eecis.udel.edu/~chao/gfp/
A politically correct (and humorous) listing of gender-neutral references.

The Traveling Gourmet
http://www.nomius.com/~gourmet/gourmet.htm
Catch up with the chef as he cooks in a new country each week.

Cat Fancier's Home Page
http://www.ai.mit/fanciers/fanciers.html
Links, lore, and a shared love for felines worldwide.

Build.Com
http://www.build.com/
Adding on? A listing of home-building and remodeling resources.

—compiled by Suzanne Kantra Kirschner (kantra@aol.com)

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BEYOND HERE

Peeper Madness

BY GINA SMITH

LEWD photos and sexually explicit articles available to just about anyone—including our kids. Pedophiles on patrol. Outraged politicians. Worried parents. Maybe this thing *is* getting out of control. Maybe, just this once, we should set aside some of our First Amendment guarantees to protect ourselves from almost certain societal decay.

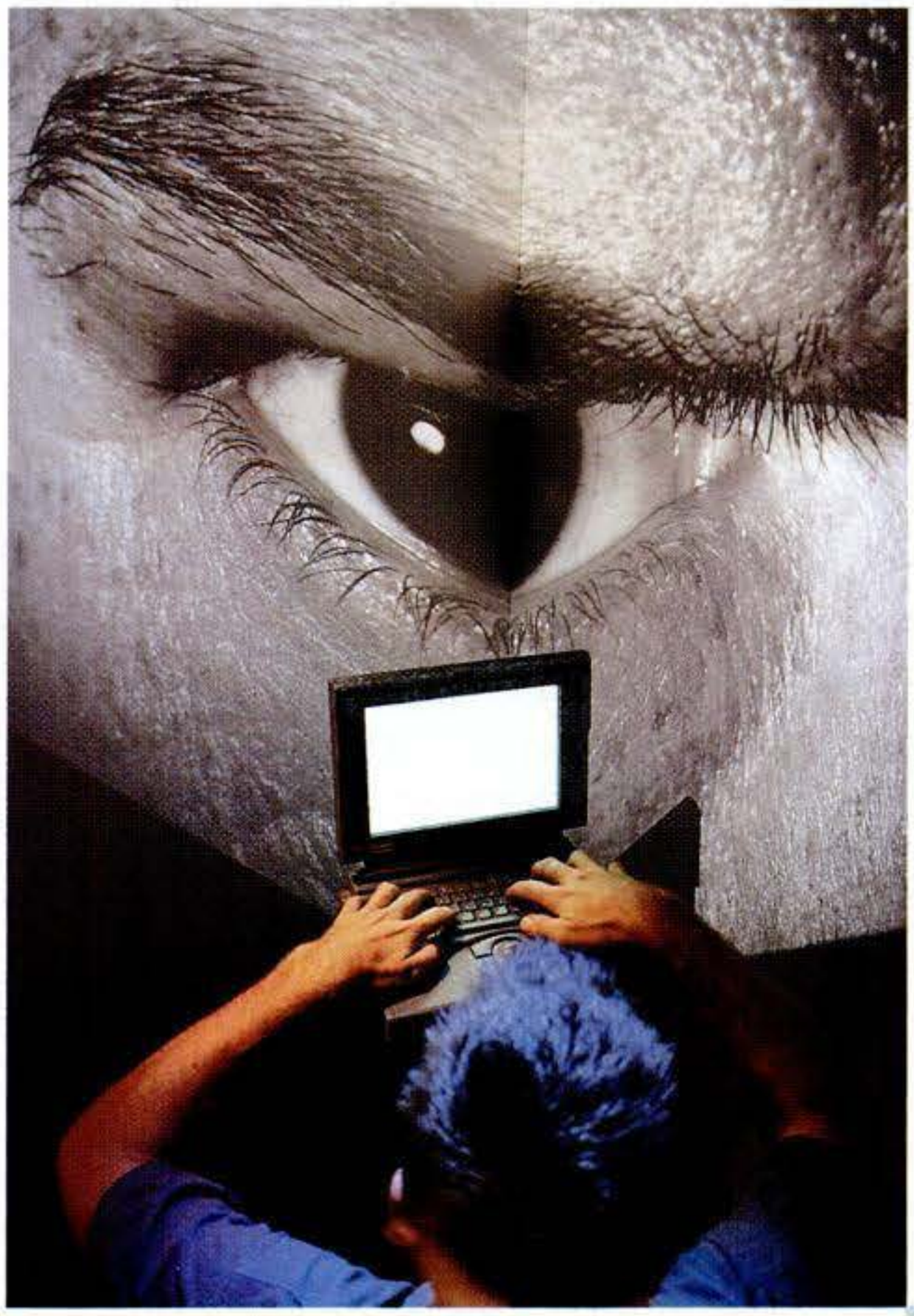
Sound familiar? It ought to. It's the Internet morality play of the 1990s. Or the *Playboy* magazine scare of the 1950s. Or the steamy celluloid reels of the 1920s. Or the erotic pages coming off the Gutenberg presses of the 1350s. No matter, it's the same fear, paranoia, and alarm we experience every time pornography meets a brand new medium.

As always, only part of what scares us is the content. Much of our fear is rooted in the new technology we don't fully understand and whose direction we can't reasonably predict. How else to explain why *Time* magazine would run a cover story on online pornography so baiting and overzealous the magazine would later have to apologize for it. Or why Congress, in the face of lengthy discussions on Medicare and welfare reform, would be debating the merits of an incredibly vague and restrictive "cyberporn" bill?

Still, it's a legitimate question: Should the Internet be censored to some degree, the same way television and radio are routinely kept within the bounds of collective good taste? Actually, we'll have to answer another question first: Can it be done?

It would be difficult at best. The Internet is a truly international medium with no central company, country, or standards body exercising anything more than symbolic authority. Hence, it's fairly uncensorable. Outlaw the act of producing or communicating something in one country and the Internet site will just find a home on a computer in some other country—and still be readily available to anyone with a modem. It's what technicians call a distributed network, and it's a censor's worst nightmare.

And is censorship really necessary? The fact is, every time a mass medium arrives, pornographers are among the first to use it. Dirty stories probably did more for the literary upbringing of Middle Age Europe than all of Chaucer's tales put together. More recently, VCRs were pricey play toys for hard-core film buffs until soft-core porn hit the little screen. Then came the masses.



JOHN B. CARNETT

But—and this is the part you rarely read about—porn always fades to the background as quickly as it comes to the fore. Today, despite the porn movie scare of the 1920s, the mainstream movie business dwarfs the porno racket, which is largely relegated to the back room. And only a small percentage of magazines, books, and comic books are dirty enough to be objectionable to most Americans. Erotica leads, then steps aside to let the mainstream pass.

This doesn't mean there's nothing to worry about. Online porn is more accessible to kids than the old-fashioned variety, and the interactive nature of the medium makes it easier for the creeps of the world to talk to your children. You can exercise some control with programs like SurfWatch, Net Nanny, and Cybersitter. These programs block access to known objectionable sites and/or filter Net sites for dirty words. They generally do a poor job of weeding out dirty pictures, however.

But beyond that, the only real solution is an old-fashioned one: being involved with what your children are doing and thinking, and educating them about the dangers posed by strangers—in person and online.

Twenty or 30 years from now, I suspect we'll all look at the Great Cyberporn Scare of 1990s with the same amusement and quaintness we view the Reefer Madness alarm of the 1930s. That's just as well. We'll no doubt have some other new medium to worry about. Because it isn't just history that repeats itself. We do, too.

Gina Smith is the author of 101 Computer Answers You Need to Know, *and a syndicated radio talk show host. She appears regularly on Good Morning America. E-mail her at heyGina@aol.com.*

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DIGITAL MISIC

CyberJam Grooves

RECENTLY, VISITORS to a London electronics show called "Live 95" were treated to a concert by the group Res Rock Surfer. But the bandstand was eerily empty, save for giant speakers. That's because the musicians were scattered around the world, linked to each other—and the soundstage—by modems and PCs.

The online musical collaboration was made possible by software called the Distributed Real-Time Groove Network (DRGN), and it has enabled musicians in North America, Europe, Asia, and Australia to play together with nothing more than a computer, synthesized instruments, and standard Internet connections. The process is similar to being in an online chat room, except you can play music in addition to talking. A group meets online at designated times for jam sessions. One musician might start things off with a synthesized drumbeat, then another adds a bass line. DRGN blends the pieces together, creating the illusion that everyone is playing at the same time and in the same place.

While DRGN is already being tested on the Internet, it's slated to become commercially available sometime in early 1996. The program will be released on CD-ROM. The software, written by former Northwestern University music students Matt Moller and Canton Becker, won't replace the recording studio anytime soon, but should make for interesting sessions.—*Steve Nadis*

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GAMES

New graphics techniques make racing real.

3-D Action Graphics

IF YOU'RE NOT yet hooked on computer games and you'd prefer to stay that way, steer clear of the latest 3-D entertainment gear. A wave of 3-D graphics cards and new software titles that exploit their digital magic are poised to draw you into the action.

New 3-D boards from Creative Labs, Diamond Multimedia, 47-Tek, and others deliver more colors, higher-resolution graphics, and full-screen video for $250 to $450, depending on the amount of video memory. With software that supports 3-D graphics, the effect is a new level of realism—carlike racing action in Papyrus's Nascar game and near-arcade-speed fighting in Virtua Fighter Remix, for example.

The key to the process is that the boards form objects using polygons instead of squares, the same way 3-D objects are created on workstations for animated films. Once the object is in this "solid state," a texture is laid over it. This could be fur on a bear, grains on a sand dune, or the flesh on a human hand. This is done in real time, enabling software makers to keep the action moving.

Soon, games will begin using video as a texture. Live actors will be filmed and the video placed onto 3-D replicas of the actors. This makes replacing linear video clips with interactive sequences a lot easier and involves you more with the game.—*Suzanne Kantra Kirschner*

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Quick Fix Utilities

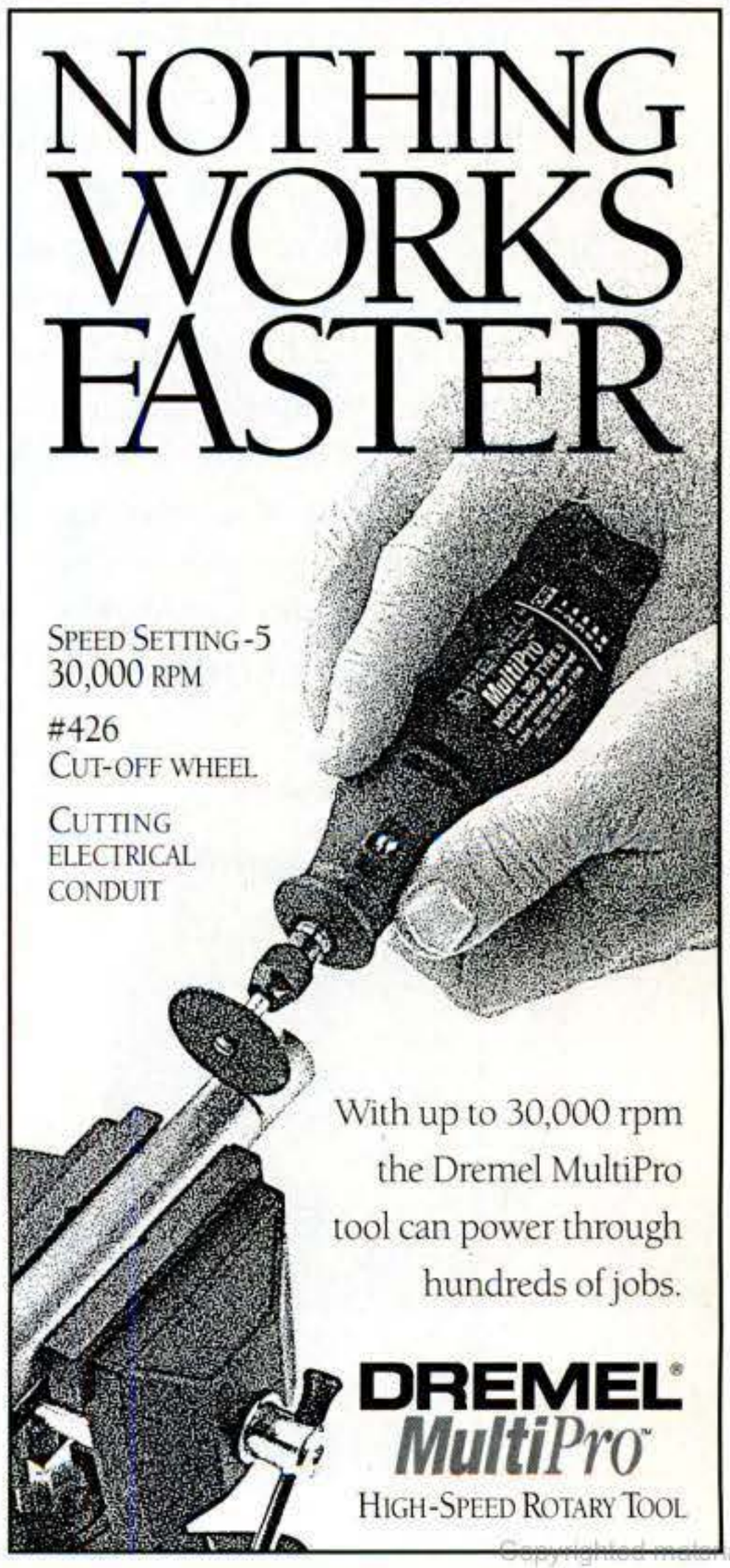
WINDOWS 95 SOLVES a number of nagging problems, but it also creates a few—like using long file names with Windows 3.1 programs designed to handle only eight-character names. The solutions to some of these problems are already on the software shelf.

The answer to the file name dilemma, for example, can be found in one of several new utility programs that enable Windows 3.1 applications to recognize names up to 255 characters, as does Windows 95. Other utilities tackle the "not enough memory" problem that typically occurs when you're trying to run two or more programs at once. These "soft memory" utilities don't give you any more physical memory, the way a new set of RAM chips do, but they use compression techniques to make better use of the memory you've got—often doubling your working room in Windows 95.

Another potential pickle: Removing or "uninstalling" programs you've loaded onto your system. Windows 95 includes an uninstall routine, but it works only with new applications that support this feature. Separate uninstall utilities work with nearly all Windows programs.—*C.O.*

A Sampling of Software Fixes for Windows 95

PROBLEM	PRODUCT FIX (COMPANY)
SYNCHRONIZING LONG FILE NAMES	**NAME-IT** (VERTISOFT)
	LONG FILE NAMES (VIEW SOFTWARE)
NOT ENOUGH MEMORY	**RAM DOUBLER** (CONNECTIX)
	SOFTRAM 95 (SYNCRONYS)
	HURRICANE (HELIX SOFTWARE)
REMOVING OLDER PROGRAMS	**UNINSTALLER** (MICROHELP)
	REMOVE-IT (VERTISOFT)
VIEWING GRAPHICS FILES	**HIJAAK 95** (INSET SYSTEMS)



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PORTABLE PCs

Moving Multimedia

HIGH-SPEED Pentium computers with fast CD-ROM drives, stereo sound, and big screens are nothing new—unless you're talking about models you can put on your lap.

IBM's ThinkPad 760CD, Compaq's LTE 5000, and Toshiba's 700 series are leading this noisy, versatile charge. Each runs on Intel's new 120MHz Pentium chip, which actually preserves battery life better than previous, slower chips. Quad-speed CD-ROM drives are standard, as are stereo speakers and microphones (for speaker phone, voice navigation, and other uses). And all three sport bright color LCD screens of at least 10.4 inches.

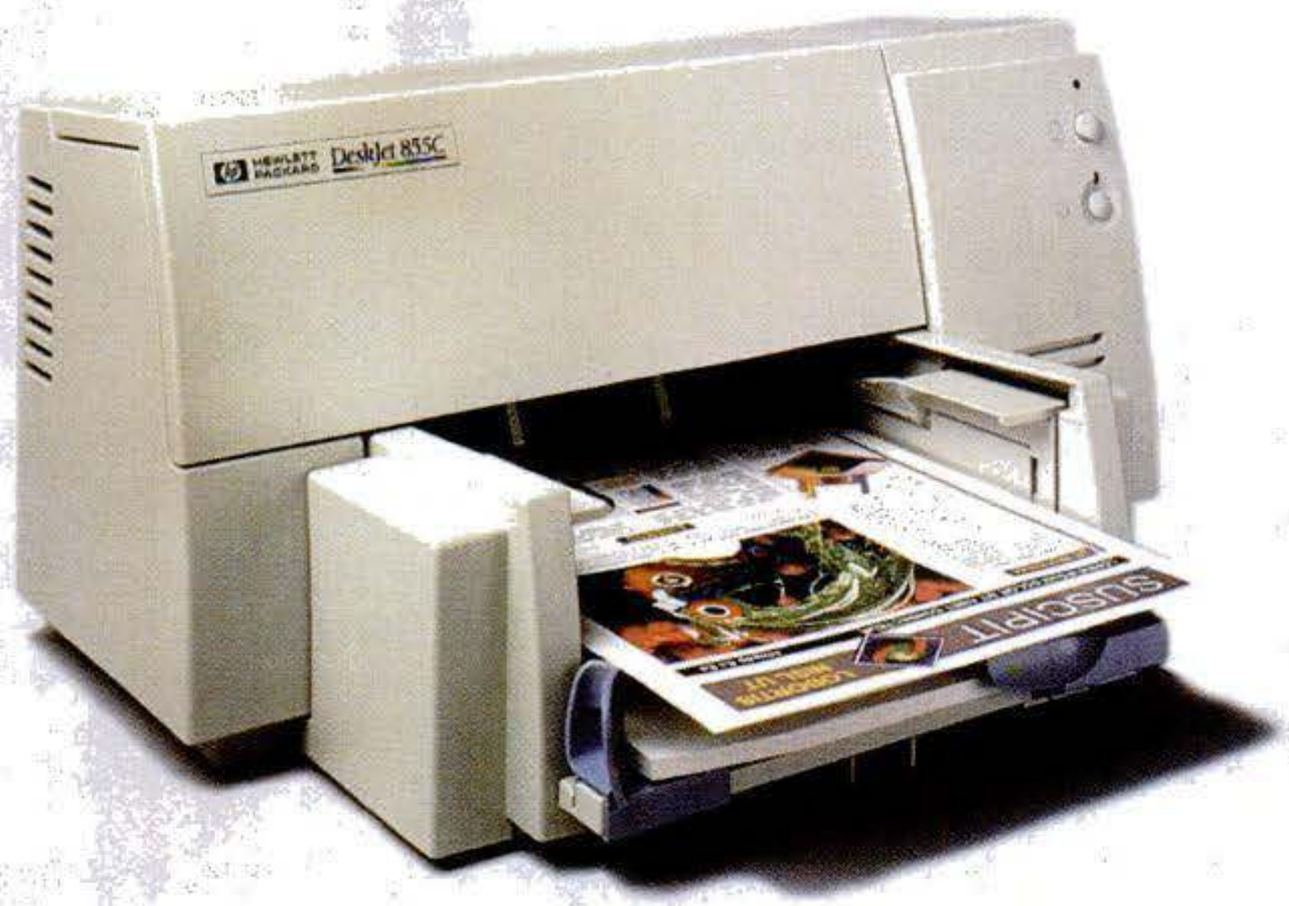
The ThinkPad 760CD is easily the most advanced of the colorful bunch. It has an MPEG-2 chip inside for full-screen, full-motion video with software that supports the MPEG (Motion Picture Expert Group) standard. And it has an unusually large 12.1-inch active-matrix color display. That's still smaller than the 15-inch screens on desktop systems, but the 760CD includes a VGA-to-NTSC converter that lets you hook the computer to a TV.

The price of miniaturized multimedia is still precious, however. These jet-setting jewels will cost you between $5,000 and $8,000.
—*Suzanne Kantra Kirschner*

Laptops like the ThinkPad760CD include all of the multimedia extras.

JOHN B. CARNETT

PRINTERS



Color Ink-Jets with a Photo Finish

MAYBE COLOR lasers aren't the future after all. Quietly, ink-jet printers have traded their fuzzy and faded colors for vivid, high-resolution images that are beginning to rival the quality of color laser and even specialty thermal transfer color printers.

As usual, Hewlett-Packard is in the vanguard of this printing evolution. Its new DeskJet 850C prints color images at the usual 300 dots per inch but uses a new "color resolution enhancement" technology that varies the size and color intensities of individual pixels. On ordinary paper, the output is very sharp. On glossy paper, the result is near-photographic-quality output. In fact, a version of the same printer, called the 855C, will include a Kodak mailer for transferring photos to a Photo CD disc to incorporate them into documents.

The 850C (and 855C) sells for about $550. It includes printer ports and software for both Macintosh and Windows PCs. The new DeskJet 1600C produces similarly stunning color pages, but at the relatively rapid rate of 4 pages per minute. Designed for heavier use and office networks, the 1600C lists for $1,399.

There are other much-improved choices, too. Canon's new BJC-610 ($599) and Epson's new Stylus Pro ($999) models use higher resolution modes to produce color output that's comparable to the HP models.—*C.O.*

OPERATING SYSTEMS

TKO for OS/2?

DOES THE SUCCESS of Windows 95 spell the end of OS/2? Even some OS/2 software developers are beginning to think so after the recent departure of several key executives in IBM's Personal Software division and statements of lukewarm support from senior managers.

Officially, however, IBM says it is still at work on the next version of OS/2 Warp, due out this coming spring. Among other things, this version of OS/2 would make it easier for software makers to create programs that run on both OS/2 Warp and Windows 95. The company says it is also close to finishing a version of OS/2 for the PowerPC, which would run on IBM's Power series of workstations and possibly on other systems built around the PowerPC chip.—*C.O.*

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• A CONNECTICUT MAN DIES of a newly identified tick-borne disease called human granulocytic erlichiosis, or HGE. It is caused by a previously unknown bacterium.

• A college student contracts a mortal case of Hanta virus infection at his summer home on Shelter Island, New York, off Long Island. The rare virus is carried by rodents and was previously known only in the deserts of the Southwest.

• And in Zaire, a new outbreak of lethal Ebola virus breaks out, not in a forest village but in a modern city of 600,000, throwing a scare into a whole nation.

BY ROBERT COOKE • PHOTO ILLUSTRATION BY AMY GUIP

In 1969, then U.S. Surgeon W. H. Stewart announced it was "time to close the book on infectious diseases." Apparently, disease microorganisms didn't listen. Since then, in addition to the pathogens named above, we've had an expanding AIDS epidemic, Lyme disease, toxic shock syndrome, Legionnaire's disease, and the grimly named flesh-eating bacteria.

Indeed, what scientists, doctors, and other medical specialists are coming to realize and warn about is that microbes could very well close the book on *us*, rather than the other way around. We are vastly outgunned, in terms of sheer numbers and the great variety of dangerous microbes lurking everywhere. And, smart as we think we are—employing sanitation, chemicals, drugs, and vaccines against diseases—the bugs still have nature on their side.

A PLAGUE ON ALL OUR HOUSES

Prepare for fresh onslaughts of infectious diseases new and old.

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A VACCINE FOR MOSQUITO-BORNE YELLOW FEVER EXISTS, BUT IT'S NOT BEING MANUFACTURED. IF YELLOW FEVER WERE TO BREAK OUT, THE VACCINE SUPPLY WOULD BE EXHAUSTED IN SEVERAL DAYS.

Microbiologist Barry Bloom, of the Albert Einstein College of Medicine in New York City, says infectious diseases remain a constant threat because the microbes causing them are always forming successful new combinations that can outwit a host's defenses as well as the most powerful drugs.

Dr. David Satcher, who is director of the U.S. Centers for Disease Control and Prevention (CDC), warned in a statement last year that because of spreading genetic resistance, "our anti-microbial drugs have become less effective against many infectious agents, and experts in infectious diseases are concerned about the possibility of a 'post-antibiotic era.' At the same time, our ability to detect, contain, and prevent emerging infectious diseases is in jeopardy."

The problem is that with one exception—smallpox—infectious diseases have never disappeared. Despite the ability of antibiotics to knock down bacterial infections and of vaccines to defend against such viruses as polio, measles, and hepatitis, sanitation—clean water, uncontaminated food, and sterile practices—deserves half the credit for today's level of public health. And disease-causing microbes are still ready to exploit any opportunity.

Few would have predicted, for example, that a common soil bacterium would find a comfortable niche in air-conditioning systems and then emerge as an airborne lung disease. That microbe is now named Legionella, after the American Legion members it felled in a Philadelphia hotel in 1976.

AIDS may have simmered as a local disease in rural Africa until tribal societies were disrupted and road networks opened up travel. Now truck drivers and the prostitutes they patronize at truck stops seem to be central players in the spread of sexually transmitted diseases across Africa.

And in the United States, an obscure disease agent called Hanta virus struck in 1993 when mouse populations boomed after an especially wet year in the parched Southwest.

The lessons of history testify bluntly to the dangers of new microbes hitting naive populations. Emerging diseases have had a profound impact: Plague killed one-third of the European population in the 14th century; tuberculosis killed one-quarter of the European population in the 19th century. Could something with that kind of impact emerge without warning today?

The answer could very well be "yes." AIDS is creeping through the U.S. population, has killed 2 million people worldwide, and is just beginning to explode in Asia. Drug-resistant tuberculosis—especially dangerous because it spreads in the air—is showing up in U.S. cities and even aboard airliners. And tick-borne Lyme disease is booming, threatening millions of U.S. residents, especially in the Northeast. Why?

For Lyme disease, the answer is clear. We now have twice as much green land in the New York-New England corridor as we had 150 years ago. That has allowed the deer to move southward; along with the deer came deer ticks—the tiny, almost invisible bloodsuckers that often carry the Lyme disease spirochete. So opportunity knocked, and Lyme disease answered.

The problem of new and reemerging diseases is so severe because of the natural talents microbes have evolved. Normally benign microbes sometimes find new hosts, or they swap genes to acquire new virulence, or simply mutate to avoid poisons.

"The life ambition of a bacterium," Bloom says, "is to become bacteria—plural. Their only goal is survival in a very hostile world of immune responses, environmental threats, and competition."

And as the microbes' genetic shell game continues, he adds, "we can't always predict which bug is going to evolve. We know that new organisms continue to get into humans. And we know there are mutations that render pathogenic organisms much more virulent, as in the flesh-eating strep-

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tococci" [see "A Nasty Bug," below].

Fortunately, in some instances a threat can be foreseen in time to prepare defenses. An international surveillance system now watches constantly for new strains of influenza, allowing protective flu vaccines to be produced quickly when a new virus strain emerges.

But often the response comes too late. Researchers have known for almost a decade that an alien invader, the Asian tiger mosquito, is now at large in the United States. Tiger mosquitos entered the country as stowaways in puddles of water in used tires that were being imported from the Far East. Experts think tiger mosquitos came in through Houston, Texas, in 1985 and then began their inexorable spread, especially in the hospitably warm, humid Southeast.

Having a pesky new mosquito is bad enough. But the real danger lies in the tiger mosquito's ability to carry some truly awful viral diseases, including dengue and yellow fever.

"The tiger mosquito is a competent vector for both viruses," as well as others such as eastern equine encephalitis, says Roger Nasci, at the Centers for Disease Control's arbovirus laboratory in Fort Collins, Colorado. ("Arbovirus" stands for "arthropod-borne virus," those carried by mosquitos, ticks, and the like.)

Biologist George Craig Jr., at Notre Dame University, warns that even in the absence of cases of known disease caused by the tigers, the risk of a major health problem is growing as their population expands.

Since arriving in the United States 10 years ago, tiger mosquitos have spread to 537 counties in 23 states, some being reported as far north as Chicago. The buzzing, stinging insects are now so ubiquitous in some areas, such as New Orleans and some Florida cities, that they have become the dominant mosquitos there.

"In Jacksonville, Ocala, and Gainesville (all in Florida), you step out your back door and these things hit you," Craig says. "The numbers are growing, and we're not very good at controlling them; concerted mosquito control methods such as draining marshes and spraying insecticides are not very effective."

Unfortunately, tiger mosquitos have ample opportunity to pick up and spread diseases from various sources. Researchers were surprised to find that they attack so many different kinds of animals, including cows, horses, rats, birds, and humans.

"They are turning out to be the most catholic of mosquitos" in terms of their feeding habits, Craig says. "In East St. Louis, for example, their primary blood meal is from rats."

One of the diseases that may eventually be picked up and spread by tiger mosquitos is dengue, also known—with devastating accuracy—as breakbone fever. It is already endemic throughout the Caribbean, including Puerto Rico and the U.S. Virgin Islands. A victim's initial infection by dengue is usually bad enough, causing symptoms that include fever, headache, and very severe joint and muscle pain.

But a second dengue infection caused by a different strain of the virus becomes truly dangerous. The combination generates a 30 percent death rate in children.

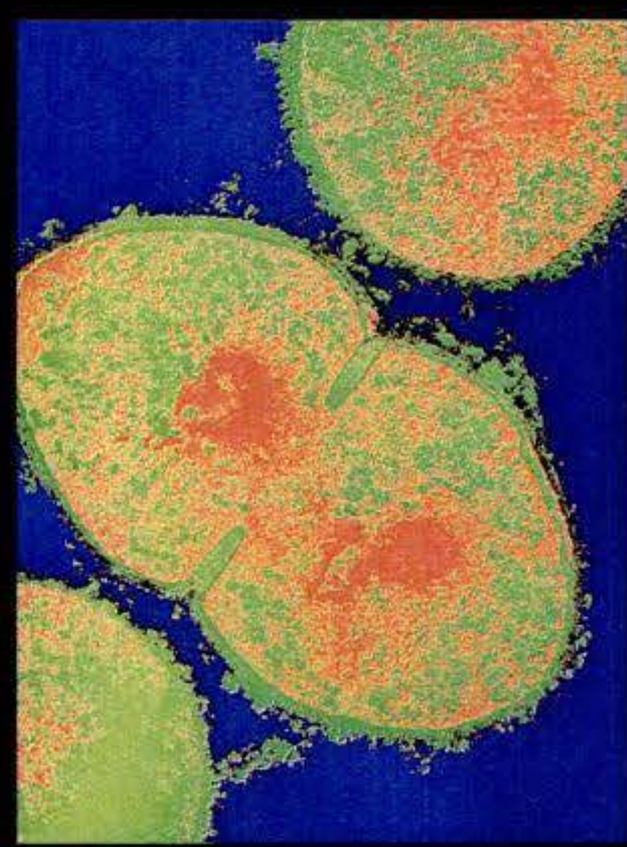
In the past, the different strains of dengue were separated by long distances. "But now modern transportation is getting them all mixed together in places like the Caribbean," Craig says. The mixing may also soon occur in Florida and Louisiana. On a worldwide basis, he adds, dengue is very widespread, "right up there with

A Nasty Bug

AS FOR THE SO-CALLED "flesh-eating bacteria," the danger is real, the fear seems overblown, and the understanding of what's going on is slim. The microbes that cause necrotizing fasciitis (killing of connective tissue) are common, but what tips the balance between a relatively benign Strep A infection and a deadly outpouring of flesh-destroying toxins is not known.

It is certain, however, that such infections must be caught early and be treated aggressively with antibiotics. If neglected, the damage quickly spreads beyond the possibility of control, and death may come within 24 hours. According to estimates from the Centers for Disease Control, from 10,000 to 15,000 cases of invasive Group A strep occur annually in the United States, leading to about 2,000 deaths.

But why now? Is it just publicity that has created alarm? Or has a familiar, relatively benign bug—normally the cause of strep throat or impetigo—recently mutated and developed deadly new skills? The answers aren't known and won't be for some time, in part because case-reporting is so skimpy. Only a few states—New York, Connecticut, and Vermont among them—require hospitals to report their cases.



DR KARI LOUNATMAA/SCIENCE PHOTO LIBRARY

The dangerous strep infections usually begin with a cut, scrape, or other break in the skin. The wound rapidly becomes worse, looking red and swollen, with toxins and enzymes actively breaking down tissues surrounding it. Within six hours a small, half-inch zone of damage can expand to two inches, while the bacteria spread even faster and farther inside the body.—*R.C.*

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CENTERS FOR DISEASE CONTROL & PREVENTION

CDC–Disease Central for the Whole World

FROM OUTSIDE, THE FACILITY in suburban Atlanta widely known as "the CDC" is most unexciting. Visitors expecting monuments to diseases defeated, epidemics crushed, or threats thwarted find only a collection of buildings done up in government-bland. The Centers for Disease Control looks, and is, all business.

Inside, down long corridors lined with offices and laboratories, work some of the world's most accomplished infectious-disease experts, including epidemiologists, virologists, biologists, geneticists, and physicians.

Among the CDC's 7,000 employees are both defenders and aggressors. Defenders are ready to swing into action on short notice, ending up in Arizona and New Mexico to pin down Hanta virus, in India to stem the tide of plague, or in Zaire, struggling against Ebola virus, seeking its hiding place, its animal reservoir.

Since the CDC's founding in 1946, its experts have worked closely with local health authorities in cities, counties, states, nations and, indeed, in whole continents seeking the clues to disease, its causes, and its cures. The experts at disease-chasing are usually members of the CDC's Epidemic Intelligence Service, most of whom are doing two-year traineeships in epidemiology.

As aggressors, CDC experts are allied with the World Health Organization and leading disease specialists from other nations. Together, they've pushed smallpox into virtual extinction.

A similarly aggressive push is aimed at poliomyelitis, the dread disease associated—for those old enough to remember—with the iron lung, President Franklin D. Roosevelt's leg braces, and the March of Dimes. The goal, says Dr. David Satcher, the CDC's director, "is to eradicate polio from the world by the year 2000."

Once polio is conquered, he says, "we won't have to immunize against it, and that alone would save this country $250 million a year. It would save billions worldwide."

But the challenges to the CDC and the world's medical establishment will continue. New diseases such as AIDS will keep emerging, and science must face that reality, Satcher says. "We know we will never conquer infectious diseases. The question is whether we can control these organisms so we can co-exist."

The greatest danger, he warns, is complacency, a failure to keep research going, recognize hazards, and react in time. "If we are appropriately alert, we can in fact get the research done in order to stay ahead of the problem."

"We believe that among the `enabling factors' for emerging diseases are changes in human demographics and behavior," Satcher says. "If you look at the resurgence of tuberculosis in New York City, it has had a lot to do with crowded conditions in prisons and homeless centers. It's almost impossible to complete the course of therapy in someone who is homeless." Loss of immunity, because of AIDS, is also a factor in the spread of TB.

Diseases old and new also arrive with human travelers. "About 30 percent of TB cases come from across the borders," Satcher says. "The ease of travel means that new diseases are only one plane flight away from any city in the world."

In the face of such dangers, and in the face of declining effectiveness from antibiotics, the need for infectious disease research is more critical than ever.

"We have to make sure we invest in laboratory and epidemiological research, and in the behavioral research that will allow us to come up with new strategies, new vaccines, and new drugs," Satcher says. "The lack of support for these areas, and for public health, has taken its toll. I don't believe a single new antibiotic was produced in 1994, which tells you something about drug research today."

One reason complacency about infectious diseases arose was the great success of antibiotics in the 1950s and 1960s. "We were riding the crest of penicillin, we were on the way to eradicating smallpox, and we had started major programs against polio," Satcher says.

According to Clarence Peters, head of the special pathogens branch at the CDC, indiscriminate use of antibiotics has played a role in the development and spread of resistance. But clearly, resistance to the drugs would have emerged at some level anyway, given time.

As with most other government agencies, money for the CDC is getting scarce. Its annual budget of just over $2 billion is hardly adequate for all its tasks, which include disease research, prevention, and control, Satcher claims. Funding cuts for such work are especially painful.

"We are eating our seed corn," he warns. "Prevention is our best investment. It's an investment in the future of our nation, and as a member of the global community."

Despite the problems, however, Satcher says that "CDC continues to be the front line." Indeed, it's quite clear that the CDC is Disease Central for the entire United States, if not the whole world.—*R.C.*

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malaria," which is seen in millions and millions of people in tropical regions around the world.

Yellow fever is another, perhaps less likely candidate for transmission by tiger mosquitos. The virus causes symptoms of varying severity, including fever, headache, jaundice, and hemorrhage. Death occurs in as many as 10 percent of all cases.

Scientists have already assessed the potential results if mosquito-borne yellow fever hits a large city, such as New Orleans:

"We know the insect vectors are there," says Bloom. "A vaccine for yellow fever exists, but it's not being manufactured. So the prediction, if yellow fever were to break out, is that the vaccine supply would be exhausted in several days. Within 90 days, 100,000 people would be infected, and 10,000 would likely die. Obviously, it would overwhelm the health care system and cost huge amounts of money."

It may be difficult or impossible to avoid lapses such as the importation of a dangerous mosquito. But many other kinds of public health missteps that open the door to disease *are* preventable.

Such mistakes often consist of simple errors of omission, like failing to administer the standard vaccination series to young children, which can have serious health impacts. Whooping cough erupted recently in England after many parents, concerned about rare complications from pertussis vaccines, left their children unprotected. And in Russia, where the collapse of the Soviet Union disrupted medical services, diphtheria has reemerged as a raging health problem.

Between 1989 and 1991, 56,000 cases of measles were reported in the United States. As a result, Bloom says, "there were 132 deaths from a 100 percent vaccine-preventable disease—because we didn't get the vaccine out to the kids."

The danger is being exacerbated by patterns of modern travel. Thanks to jet aircraft, it now takes only hours for a Bombay slum dweller to reach the suburbs of London; it takes just a day or so to travel from Kinshasa to San Diego. And, as with tiger mosquitos, disease and its carriers can arrive not just with passengers themselves but also in cargo.

Beyond the threats from alien mosquitos, emerging diseases such as Ebola, and imported diseases such as AIDS, another nightmare scenario has arisen from a half century of widespread—and often indiscriminate—use of antibiotic drugs.

"We know as we throw antibiotics at organisms that unless it's done carefully, we're selecting for those organisms that are very resistant," Bloom says. If drug treatment is not aggressive enough, or doesn't continue long enough, the antibiotic kills susceptible bacteria but can leave the resistant ones to multiply blissfully.

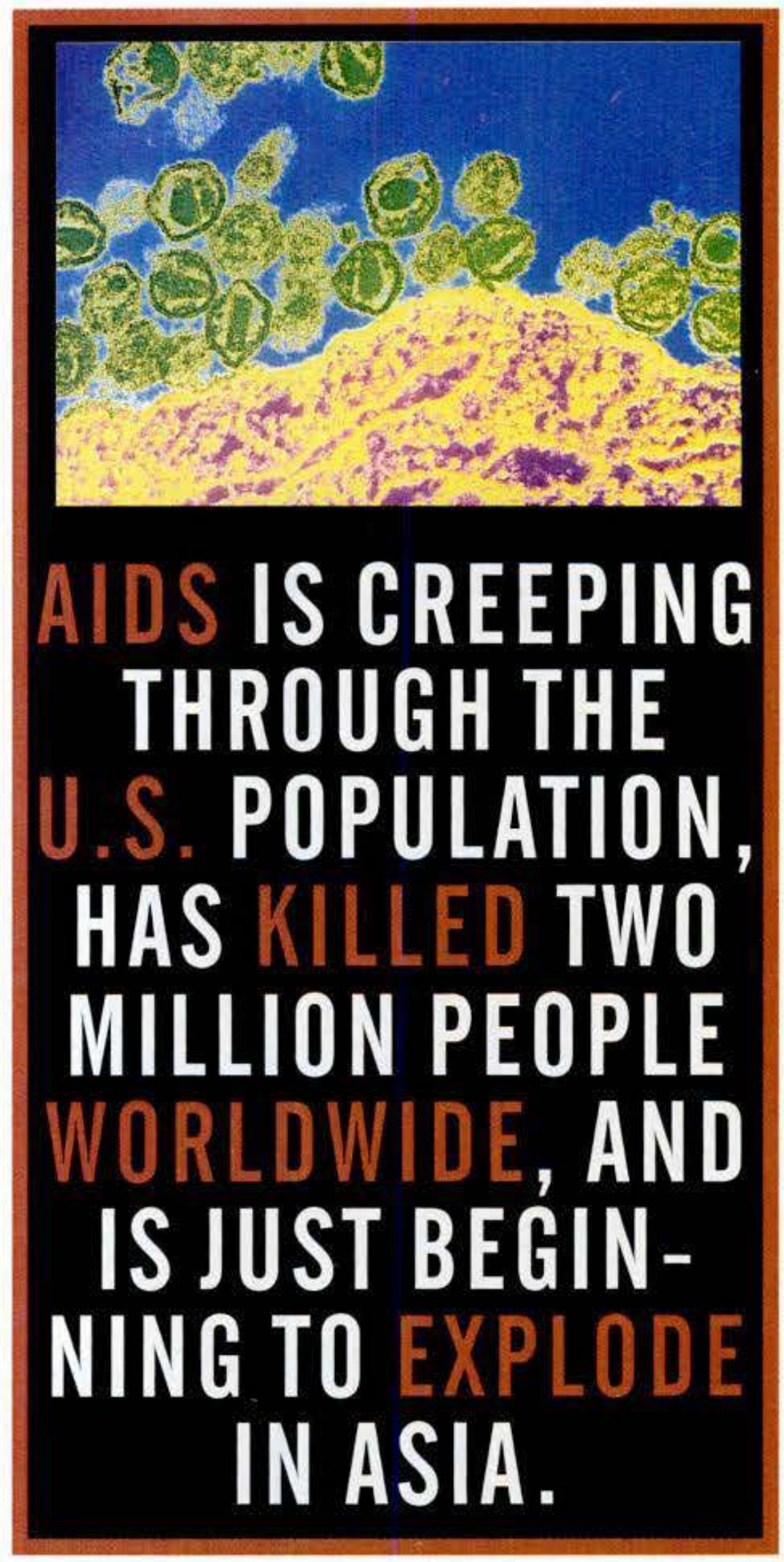

PHOTO RESEARCHERS, INC.

As part of this drug resistance process, disease organisms are constantly swapping genes with each other, so mutations that bring drug resistance occur. "There's more genetic engineering taking place in your intestine than in all of the biotechnology companies," Bloom says.

"The one we're all worried about is a major increase in Vancomycin-resistant enterococcus, an intestinal bug that is common in elderly patients after surgery," Bloom says. "It's a hospital infection, is very hard to treat, and it kills about 70,000 patients annually. And enterococcus is gradually becoming drug resistant."

The threat is that the genes for resistance to Vancomycin may get transferred into the most common hospital-based infection, staphylococcus, which is already resistant to penicillin and is becoming resistant to a related antibiotic.

"For now, staphylococcus is treated very well with Vancomycin," Bloom says. "The nightmare is that if the gene for Vancomycin resistance in enterococcus jumps to staph, we'll have a strain for which we have no appropriate antibiotic on the shelf. That will potentially decimate patients who've undergone major surgery."

There's also a possibility that disease problems will soon be brewing in California. If the Golden State enforces last November's vote to deny routine medical services to illegal immigrants, a pool of unvaccinated, vulnerable people could soon build up,

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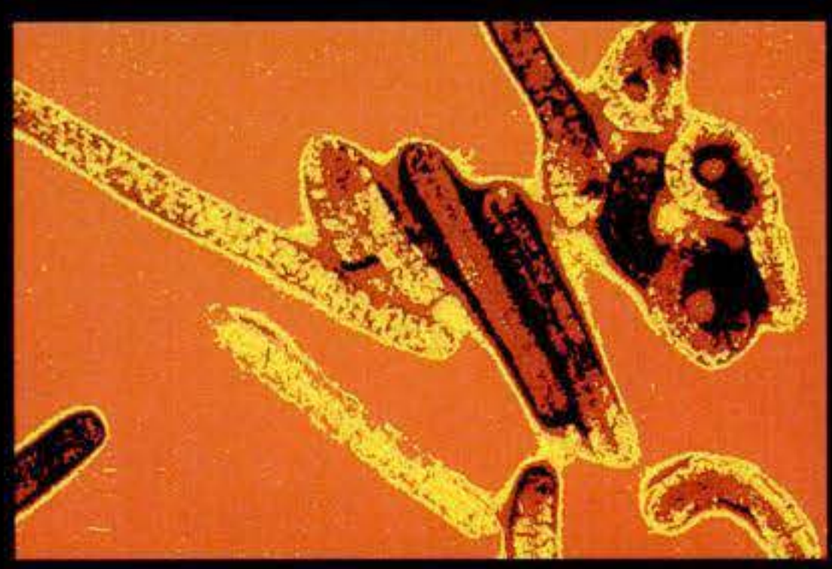

R. GREEN/PHOTO RESEARCHERS, INC.

EBOLA VIRUS AMONG THE 600,000 PEOPLE OF KIKWIT IS A FRIGHTENING EXAMPLE OF OVERCROWDING, POOR SANITATION, AND LACK OF MEDICAL CARE.

raising the odds of a disease outbreak.

"Because of the stinginess in taking care of people—and the stinginess in supporting research—we're setting ourselves up for some unpleasant surprises," says population scientist Richard Levins, at the Harvard School of Public Health.

In time, huge costs may follow if diseases erupt within a large population of unprotected people. And if the undocumented workers and their families fail to seek treatment, fearing identification as illegal aliens, diseases may fester longer, wider, and have even greater public health impact.

"The most vulnerable populations are the source of diseases for everyone else," Levins warns. "And the sources that are most dangerous are the prisons, nursing homes, and day-care centers."

To launch a disease requires certain conditions, and each disease organism has its own set of preferences and requirements.

"By looking at it from the point of view of the pathogens," Levins says, "we can get some idea of the factors that allow a microbe to infect a host, reproduce, and spread. What does it need to be happy? It has to get a good meal. It also has to escape the host's defenses. And it has to have an exit to get to another host. Each microbe juggles these opposing demands in the light of the capacity it has, its genes."

Levins, who looks at diseases from a broad ecological perspective, also says that every disease needs a minimum population. "Malaria became a human disease only after the development of agriculture. Before that, there weren't enough people to sustain it. You need a few hundred thousand people to sustain measles. We don't know what other diseases may require several million people. Giant cities are growing in developing nations now." Because of overcrowding, poor sanitation, and lack of medical care, such cities may be the seed bed for future epidemics. Ebola virus among the 600,000 people of the major city Kikwit, in Zaire, is a frightening example.

Among the viruses, Levins says, the ability to pass genes around like so much loose change underlies the constant threat of new epidemics. And humans increase the danger because of agricultural, industrial, and social practices. Strange combinations of viruses end up producing hybrids that can outwit their hosts' immune defenses and sometimes expand the range of hosts.

This is apparently what happens when new strains of flu spread worldwide from China, where farmers raise pigs and ducks together. An avian flu virus from ducks infects pigs, and inside the pig cells the flu virus swaps genes with mammalian viruses.

The result is constant rearrangement of the flu virus' genes, creating new strains of influenza that eventually infect the farmers. New vaccines to combat the new strains then have to be designed and distributed.

A large part of the problem, says biologist Richard Young of the Whitehead Institute, is that we're still unjustifiably complacent about the dangers of infectious diseases. Also, knowledge is scarce. For example, he says, "we still don't understand today what makes a vaccine work or not. What principles can we use to generate new vaccines? Our predictive powers are poor, because we don't really know what the interplay is between the host and disease that results in successful protection."

Nonetheless, Young says, if vaccines can be developed they are probably the most cost-effective way to deal with major diseases. In the absence of vaccines, hygiene and education are often the only weapons.

Levins, who argues that "poverty is the biggest threat in the world today," also warns that in the struggle to understand and fight infectious diseases, "science is too fragmented," hampered by artificial barriers and lack of communication. "Epidemiologists don't talk to plant pathologists, the psychological and physiological realms are treated separately, and medical education ignores ecology, evolution, and genetics."

As a result, the dangers and the reasons for worry are real and getting worse. "New health problems are threatening," Levins warns, "and our science isn't up to meeting them." ◆

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By Steve Nadis

Bomb Stoppers

Experts are devising strategies to protect buildings from terrorist attacks.

THE BOMBING of Oklahoma City's Alfred P. Murrah Federal Building last spring raised unsettling questions about the ability of other buildings to withstand similar attacks. U.S. embassy buildings overseas are required to meet strict bomb protection standards, but similar standards do not exist for domestic buildings. Congress is now examining the security of the nation's 8,200 federal office buildings, with politicians turning to structural engineers and security specialists for advice.

Most experts agree that the design of the Oklahoma City building contributed to the high casualty count. Vertical columns on the front of the nine-story structure rested on a horizontal beam two stories above the ground. The ground-level bomb blast knocked out smaller columns supporting the beam, eliminating the support for the larger columns on top. As these columns gave way, huge chunks of the building tumbled down.

Experts such as Eve E. Hinman of Failure Analysis Associates, a leading authority on defensive architecture, recommend that the supporting columns of a building extend all the way to the foundation. Hinman also advises that steel reinforcing bars inside the concrete columns be interlaced with rebars in the building's floors and horizontal beams.

"Ideally, every structural element should contribute to the load-carrying capacity of the building," explains Robert Crist, an engineer with the Black & Veatch firm in Kansas City. "If one of these elements is knocked out by an explosion, the other elements pitch in to absorb some of the load."

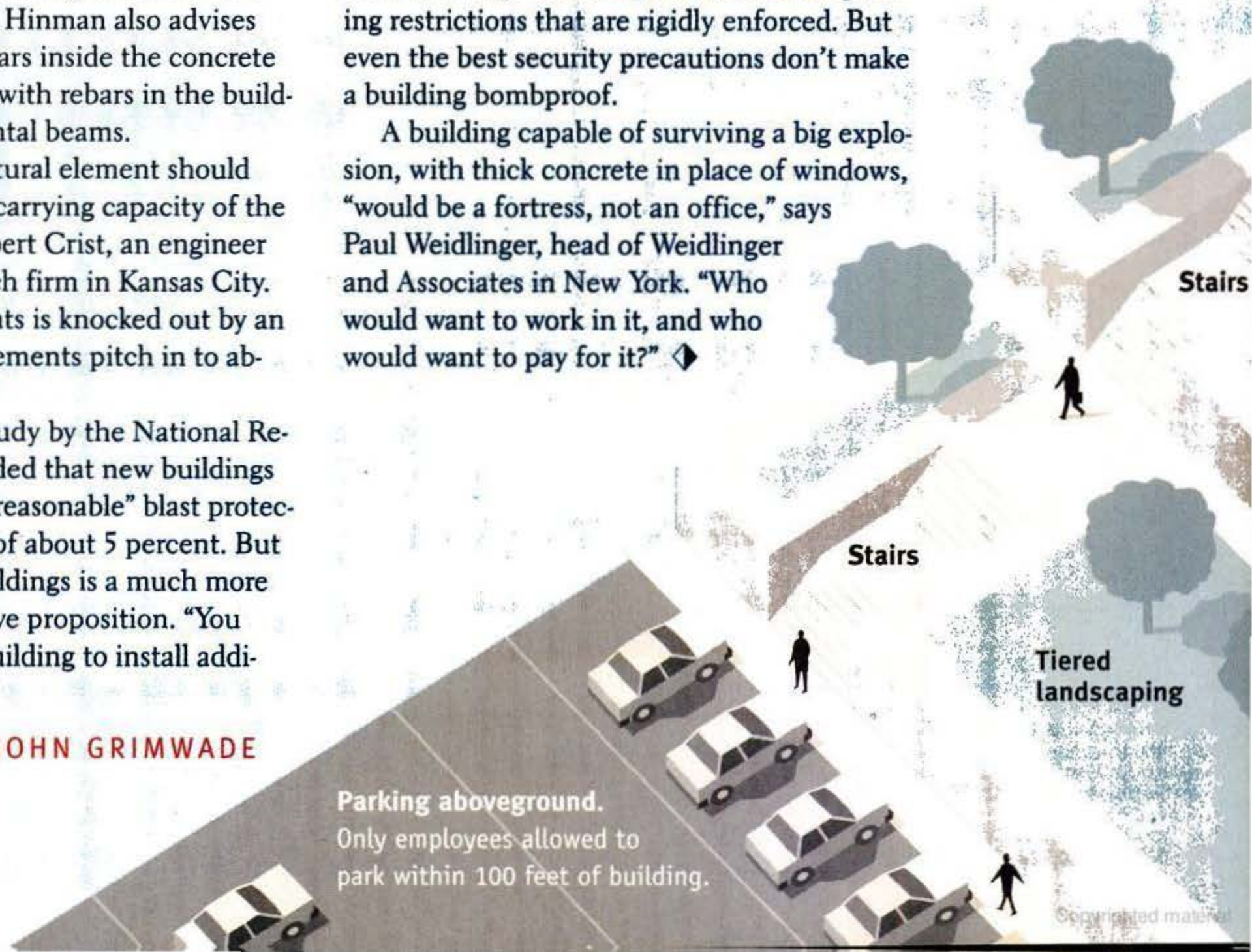
An October 1995 study by the National Research Council concluded that new buildings can be designed with "reasonable" blast protection for an added cost of about 5 percent. But shoring up existing buildings is a much more expensive and disruptive proposition. "You have to drill into the building to install additional bracing," says H. S. Lew at the National Institute of Standards and Technology. "The entire facility has to be vacated for a considerable period of time."

Less drastic steps can be effective, however. For example, ordinary windows can be replaced with thick, blast-resistant glass, or coated with shatter-dampening plastic film. Vents, valves, or "blow-out" panels can be installed throughout the building to alleviate pressure from an internal blast. And physical barriers such as high curbs or concrete planters can prevent vehicles from getting too close to the building. (Pressure from a bomb blast falls off dramatically with distance.)

Perhaps the best protection against bombs is beefed-up security: continuous monitoring by surveillance cameras, bomb detectors in use at all building entrances, and traffic and parking restrictions that are rigidly enforced. But even the best security precautions don't make a building bombproof.

A building capable of surviving a big explosion, with thick concrete in place of windows, "would be a fortress, not an office," says Paul Weidlinger, head of Weidlinger and Associates in New York. "Who would want to work in it, and who would want to pay for it?" ◆

INFOGRAPHIC BY JOHN GRIMWADE



Parking aboveground. Only employees allowed to park within 100 feet of building.

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Experts recommend these features to protect a new building from bombs. Some of the recommended measures harden the building against blasts. Other measures prevent car bombers from getting too close to the building.

Roof slabs at least 8 inches thick.

Atrium dissipates blast effects.

Floor slabs and roof reinforced using a two-way scheme—rebar placed in a crisscross pattern.

All framing constructed with poured-in-place reinforced concrete.

"Wedding-cake" elevation reduces area directly hit by blast.

Exterior walls at least 12 inches thick.

Simple rectangular layout minimizes effects caused by reflected blast waves.

"Seismic detailing." Rebar in floor slabs should interconnect with rebar in columns and beams, so the framing becomes an integrated whole.

Little or no ornamentation. All external cladding should be made of lightweight materials.

Surveillance cameras

Windows fill no more than 15 percent of wall area between supporting columns.

Blast curtains catch pieces of glass, while allowing air blast to pass through.

Columns spaced no more than 30 feet apart.

Plastic Mylar coating on inside face of windows.

Reflecting pool

Supporting columns should extend to the foundation.

Base slabs at least 8 inches thick.

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The Village Green

New communities offer an environmental alternative to suburban sprawl.

By Mariette DiChristina

WHEN SHE LIES AWAKE LATE at night, Liz Walker sometimes thinks she has become her own worst nightmare. "I've always been an environmental activist," she says with a downward glance at her sandals. "Now I have turned into...a developer."

But a developer is what Walker has had to become, in order to mold 176 acres of rolling meadows and woods in Ithaca, New York, into a new type of residential community: one that is more environmentally conscientious than today's typical suburban subdivisions.

Construction of the new community, called EcoVillage, began last fall. Every aspect of the development project—from the site's overall land use to the type of toilets that were chosen for the individual dwellings—has been planned with the environment in mind.

If that sounds like an awfully earnest quest, it is. To Walker and codirector Joan Bokaer (who started EcoVillage with Walker five years ago), the project is the cornerstone of a new vision of more responsible living. And the EcoVillage planners are just one of many such groups attempting to build green on a grand scale.

The idea of planning environmental communities has evolved over many years. The energy crisis of the 1970s jolted manufacturers into designing appliances that were more energy efficient. By the 1980s, the focus had expanded to include houses constructed with energy-saving designs and technologies, recycled materials, and water-conserving features. Now home builders are beginning to apply environmental principles to entire communities. Unlike individual homes, these communities can take advantage of economies of scale to make advanced technologies—such as a shared heating system—affordable.

Today's green towns are more down-to-earth than the communes and utopian communities of an earlier era. Co-housing, popular in Denmark for the past two decades and a model for EcoVillage, is one example, with its densely clustered private housing and shared community facilities. While the houses have their own bedrooms, baths, and kitchens, families regularly dine together at a

ILLUSTRATIONS BY KAREN STONELY

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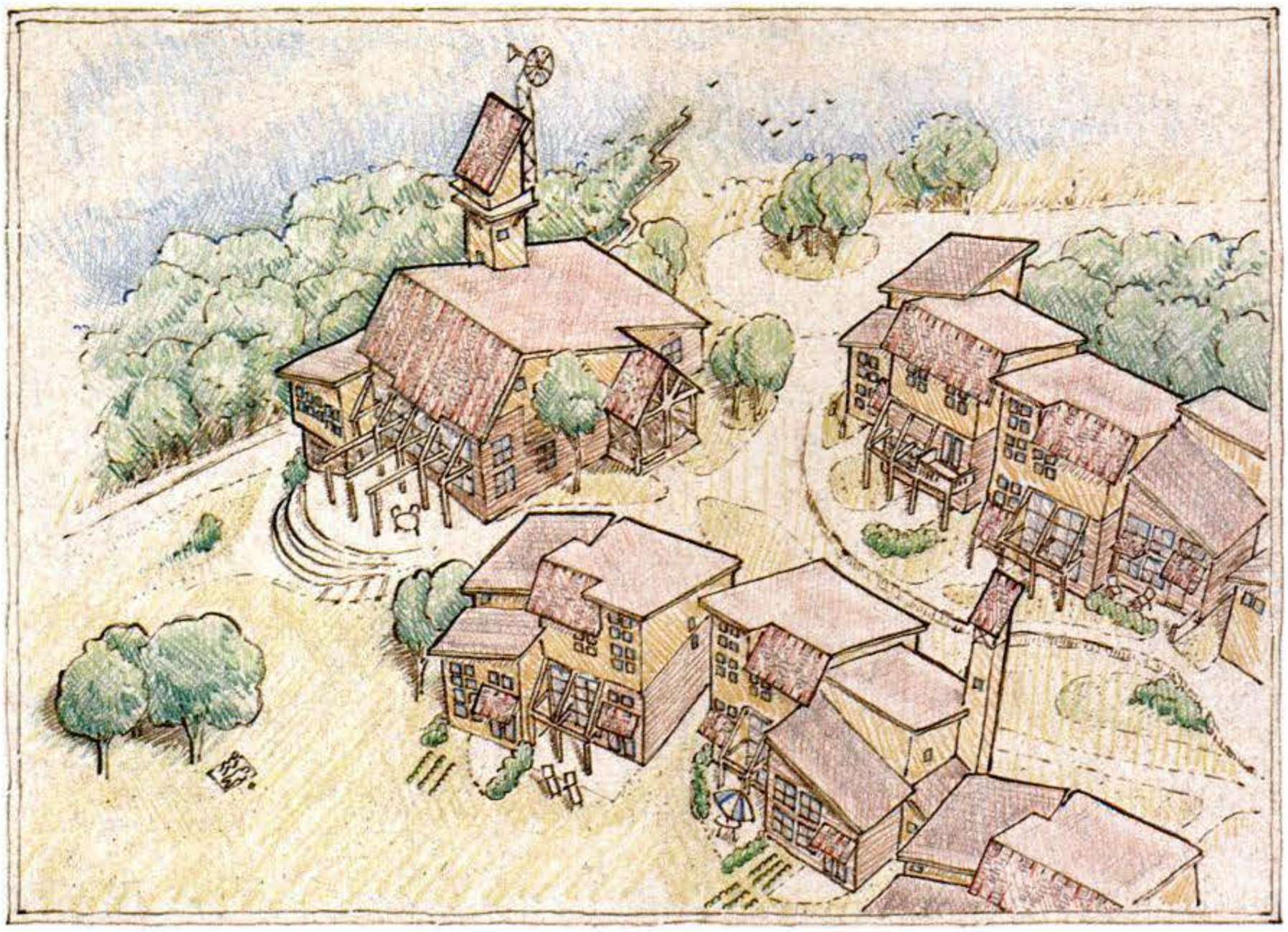
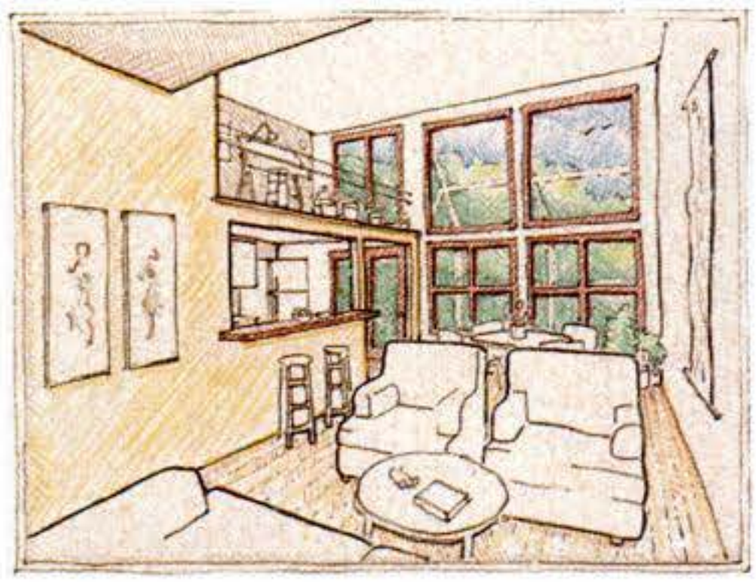
The First Neighborhood

Now under construction, EcoVillage's first neighborhood clusters individual family homes within walking distance of a "common house." Other facilities are planned.



Green commons replace such typical suburban features as paved driveways and large garages. Cars owned by EcoVillagers will be parked under carports that are located a short distance away.

The 3,500-square-foot common house (below) includes shared dining and cooking facilities, home offices, play areas for children, and even guest quarters. The individual family dwellings (right) are smaller than conventional houses.



common house. Residents share meal preparation, child care, tools, lawn mowers, and laundry facilities. EcoVillage's first common house will include "home" offices; the residents who use them will have an opportunity to socialize and share the cost of secretarial assistance.

Interest in co-housing is growing rapidly in the United States. About 150 groups have formed nationwide, and more than a dozen co-housing projects have already been constructed in California, Colorado, New Mexico, Oregon, Vermont, and Washington.

Other environmental communities use older villages as their model. These "neotraditionalist" or "new urbanist" communities include the resort town of Seaside, Florida; Kentlands in Gaithersburg, Maryland; and Laguna West near Sacramento, California. Like villages of the past, neotraditionalist towns embrace a variety of housing types. A town square forms the locus of civic life, the houses are within walking distance of local businesses and parks, and the narrow streets encourage walking and biking. In some cases, these pedestrian-friendly communities are designed along light rail or bus lines.

At the other end of the spectrum are "sustainable" communities that aim to tread lightly on the land. Dewees Island, off the South Carolina coast, aims to be the ultimate low-impact development. Only 150 houses may ever be built on the 1,206-acre island. Each house can disturb no more than 7,500 square feet of land and must nestle, partly hidden, in the island's foliage. No lawns, paved roads, or other "heavy footprint" alterations of the natural surroundings are allowed.

Despite their differences, all of these communities share the same goal: to blaze a new trail for future home

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builders, away from the sterile suburban subdivisions that have marked the past four decades of U.S. development. **A growing recognition exists among architects and planners that the suburbs, which are now home to the majority of Americans, have played a key role in the unraveling of ecosystems and community ties.**

The most noticeable difference between EcoVillage and a typical suburb is the amount of open space the development will preserve. Before the Ithaca site was purchased for EcoVillage, developers had planned to build a conventional subdivision there. The subdivision would have housed the same number of people as EcoVillage, but buildings, yards, and driveways would have been evenly distributed across the landscape. EcoVillage instead will place housing and parking on only 26 of its 176 acres. The benefit, says Bokaer, is that the families that live in all 150 units will share the 150 acres of open space. The completed units will range from $80,000 to $133,000, including shared land and facilities.

EcoVillage planners studied older communities that have survived in one place for long periods. They chose as their model Yoff, Senegal, where for five centuries villagers have lived in clustered housing immediately surrounded by agricultural lands, with the African wilderness beyond.

EcoVillage will have clustered housing like Yoff, and its first neighborhood—there will eventually be five—will have 15 duplexes of various sizes, some as close as five feet apart. The first neighborhood is now under construction, and the EcoVillagers are now seeking families interested in being part of the second. Set back from the road, the individual-family units will share a common parking lot instead of driveways, and footpaths instead of streets. These duplexes will have small private kitchens, living/dining areas, bedrooms, and bathrooms. Residents will be able to socialize in common areas, such as the dining room and recreation rooms.

Instead of individual yards, EcoVillagers will share gardens and orchards; a two-acre community organic farm is already in place. Taking advantage of a natural wet area, EcoVillage will also create a series of interconnected pools that purify water draining from nearby Route 79. Eventually, aquaculture ponds will provide fish.

Village planners tried to preserve the best agricultural soils for use in farming, and to enhance the existing water supply. "These goals sound like common sense, but they're not something a developer usually thinks about," says Walker.

The community's planning—a process so involved that a student from nearby Cornell University turned it into the subject of a master's thesis—drew on the expertise of local ecologists and landscape architects. EcoVillage tapped advisers from Cornell for the latest research in areas such as wastewater treatment and aquaculture.

But EcoVillage is not meant to be a showplace of cutting-edge technology. With twin goals of environmental soundness and affordability, the planners of the project's first neighborhood compromised on many of the "sexier"

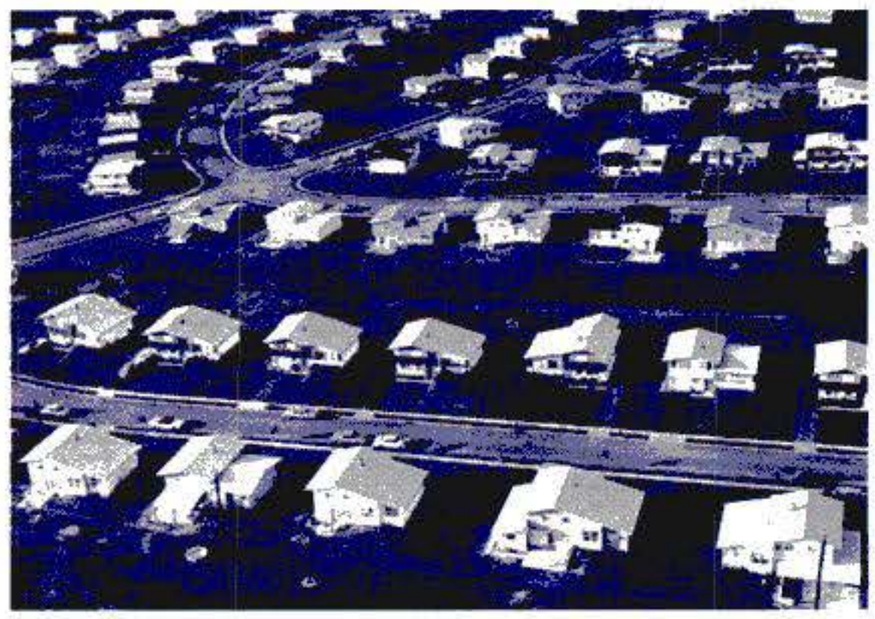
Why American Suburbs Aren't Green

THEY MAY LOOK green, with their manicured lawns and tree-lined streets—and in fact suburbs were once considered a healthy alternative to grimy, crowded urban living. But over time, the American dream of owning a house in the 'burbs has become an environmental nightmare.

"Suburbs are laid out so that you can't get to most places without a car," says Philip Langdon, who studied suburban developments in 18 states for his book, *A Better Place to Live: Reshaping the American Suburb.* Typical suburban zoning places houses at a distance from retail and commercial buildings—making a car a necessity. With cars come air pollution; shopping districts with huge, paved parking areas; and houses fronted by big garages instead of congenial porches. Cars aren't cheap, either. According to figures from the American Automobile Association, a typical suburban family has two vehicles, which together eat up about 25 percent of the household's after-tax income.

Suburbs also use more developed land to house people than urban areas, because each family has a separate dwelling and yard. Most yard space is devoted to growing lawns that are inhospitable to native wildlife. And per acre, far more chemicals are applied to suburban lawns than to the nation's farmland.

Lastly, suburbs aren't ideal places for socializing. Although the majority of Americans are now suburbanites, "there is a lack of gathering places and community life," says Langdon. "Life is more satisfying when you can get together with people."—*M.D.*



ARCHIVE PHOTOS/LAMBERT

The percentage of Americans living in suburbs has doubled since 1950.

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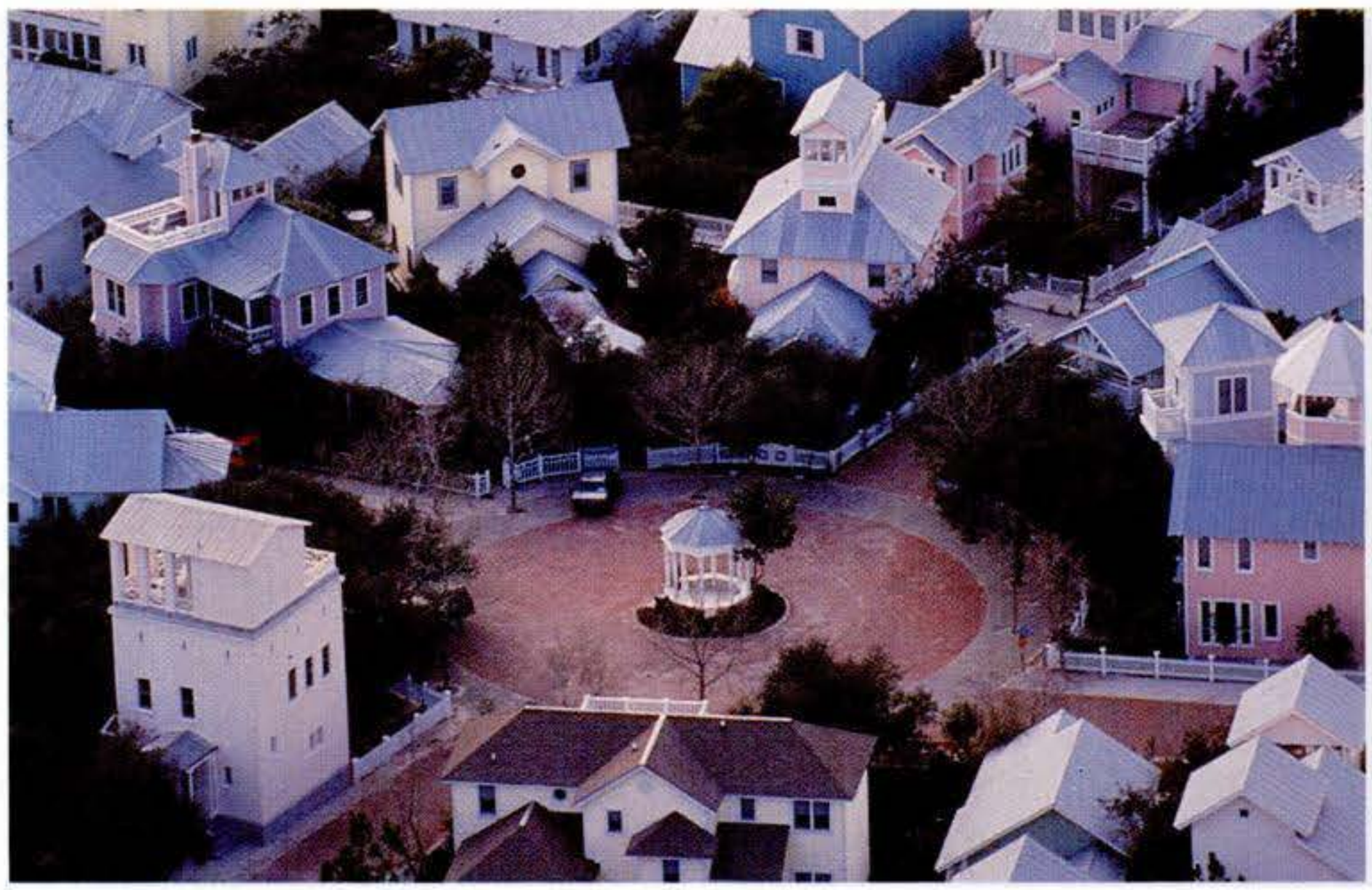
Pedestrians-rather than cars-are king at "neo-traditional" communities such as Seaside, on the Florida Panhandle.



technologies under consideration, says Walker. "We've had some people leave our group because we're not environmentally pure enough or affordable enough."

In one compromise, community planners decided to forgo using photovoltaic panels after discovering that 30 years of energy savings would be required to recoup the initial costs of installing the panels. For now, electricity will come from the local power grid. But in anticipation of future cost reductions, the community's roofs will be angled to accept solar panels.

Initially, EcoVillage will also use public sewage systems. But the long-term goal is for the community to treat its own waste. One possible method is a system developed at Cornell that uses marsh plants to filter pollutants from the water.

To plan the space- and water-conditioning systems, the community drew on EcoVillagers Daryl Anderson and Greg Thomas, who have the combined experience of more than three decades working in home-energy-related fields. "There are things you can do on a neighborhood scale that you can't do with an individual house," says Thomas. For example, a ground-source heat pump—relatively costly to install because it requires laying a lot of heat-transferring pipe outdoors—may be practical for heating and cooling the 3,500-square-foot common house. Constructing individual duplexes to share common walls will yield a 15 percent savings in heating energy, says Thomas. He adds that computer energy-analysis also revealed a surprise: Building the structures with airtight double 2x6 walls and south-facing windows that can collect heat will reduce energy consumption so much that each cluster of six to eight units in the 30-family neighborhood can actually share a single Energy Center—a gas boiler, a domestic hot water heater, and a ventilation system. In fact, the energy needs of individual residences will be so modest that boilers small enough to match them don't exist.

The energy-efficient windows that EcoVillage buildings will use are from Doorwin AccuFab of Winnipeg, Manitoba. Made with a frame of extruded fiberglass (more dimensionally stable than vinyl and less expensive than wood), the windows have three glass panes and are filled with argon—an inert gas that provides four times the insulation of air.

Overall, the duplexes in the first neighborhood will use just one-fifth to one-eighth the energy required by a comparable-size dwelling built with today's standard techniques. Energy models predict that a full winter's heating bills won't top $200—an amount Ithacans who live in conventional houses might expect to pay every month during the season.

Working with the belief that how you build is as important as what you build, EcoVillage architect/builder Jerry Weisburd aims to avoid waste during construction. Weisburd is building the common carports first—an unusual step—so they can shelter materials during construction. "If you have a place to store the materials so they don't get ruined by the weather," he says, you'll use the leftovers instead of taking them to the landfill.

Even a green community can't solve everything, however, and it was an uphill battle just to get the EcoVillage project started. Many building codes set minimum acreage requirements for each house, making it difficult to build clustered dwellings. To save planning time, Ithaca's municipal government suggested that EcoVillage be built under a "special land use district" category.

And although EcoVillage's design leaves most of the land untouched, it's hard to argue that any development is totally "friendly" to the landscape. For example, why did Walker and Bokaer choose to build new homes on an undeveloped site, rather than restore existing structures elsewhere? In addition to wanting to do their own agriculture for food, EcoVillagers want to live near open space, and clustered housing makes this affordable.

So in some ways, EcoVillagers—who tend to be white and upper middle class—are no different from other Americans who have moved to the suburbs in search of a better life. But in other respects the village itself represents a completely different way of living. Says Elissa Wolfson, a New York City native who recently moved from Connecticut to be part of the project: "I think EcoVillage will show Ithaca and other communities that alternative ways of life are possible and even preferable." ◆

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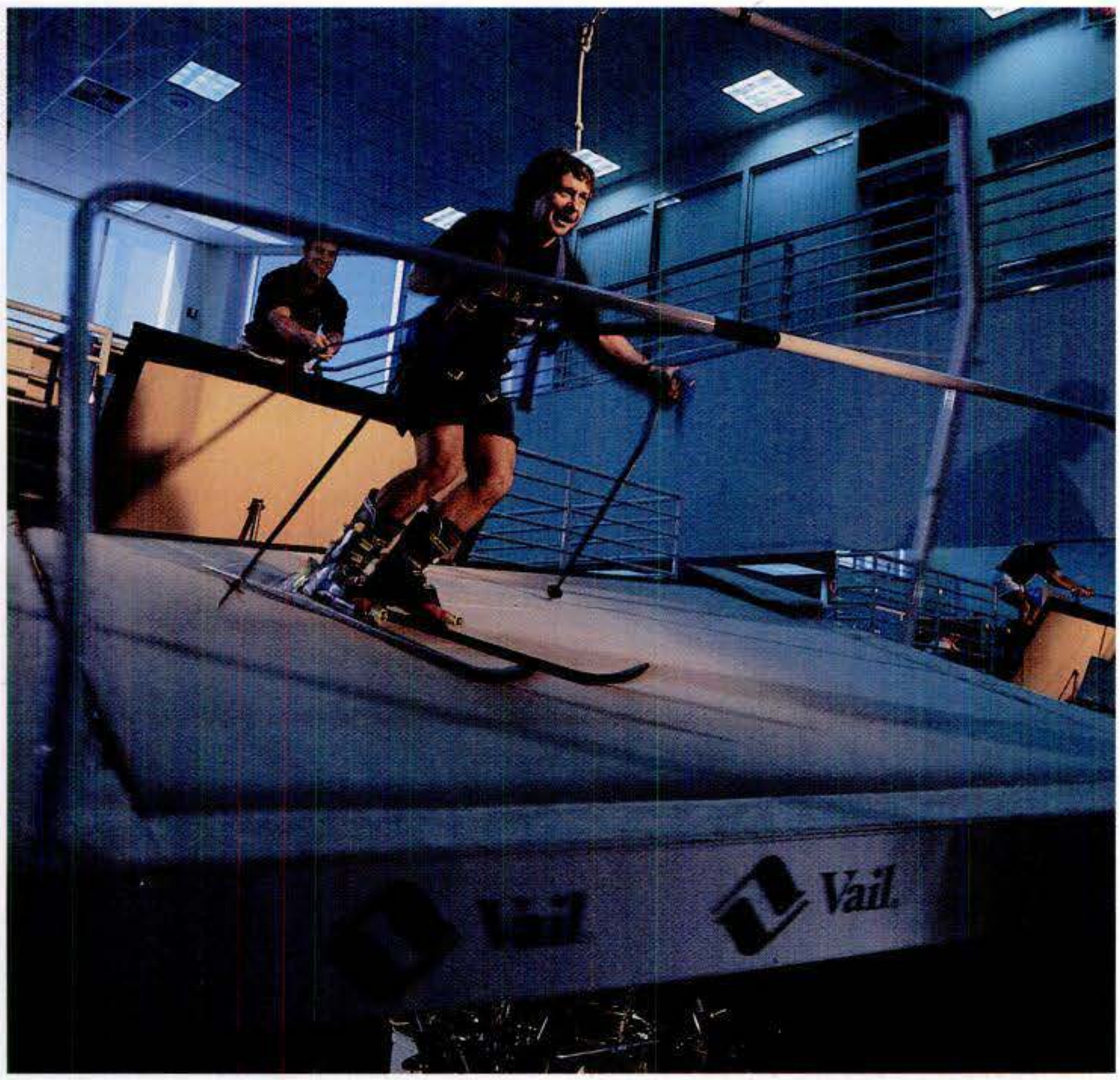
ESSENTIAL TECHNOLOGY GUIDE

EXERCISE & FITNESS

We exercise to win: First prize is longevity, enhanced quality of life, and the energy to compete in a fast-paced world. But despite the seriousness of the goals, exercise still needs to be fun. And while you're at it, why not get fit with the help of modern technology? BY BOB SILLERY

JOHN B. CARNETT



Inventor Jim Rodnunsky in mid-schuss on his high-tech Ski and Snowboard Simulator.

Simulation Sampler

WANT TO SCALE a craggy mountain precipice or windsurf serenely . . . without logging travel cost? Check out these and other simulators at an indoor site near you.

- INLINE SKATING: Nautilus Skate Machine. The only cardiovascular machine that offers lateral movement—good conditioning for sports such as tennis and basketball.
- KAYAKING: Crossrobics 2650 UE. Dip your torso in the distinctive motion of a kayaker to move a bar against the resistance of weight plates.
- WINDSURFING: Force 4 Simulator. Lean back and pull on the sail to adjust to wind velocity and wave frequency. If you wipe out, you'll land harmlessly on an inflated cushion.
- SWIMMING: Simuswim 2000. Lie on the unit's support bench, grasp the pullies, and begin stroking.

Virtual Vail

CAN'T GET TO the mountain? Just head for midtown. At the Reebok Sports Club in New York City, there's a patch of faux snow that might well be the Mother of All Simulations. The Ski and Snowboard Simulator is a surging, rolling, swaying, pitching, heaving, and yawing hydraulic recreation of the famed slope at Vail, Colorado. This one-of-a-kind simulator took inventor Jim Rodnunsky eight years and $4 million to develop. Say hello to the cutting edge of virtual exercise.

At their most complex, virtual exercisers are sophisticated simulations that deliver the demands, stresses, and sensations of a sport or exercise with unprecedented verisimilitude and precision. On a smaller scale, a dose of silicon-generated virtual reality makes for sweaty scenarios. Beginning to show up at some health clubs are the VRBike and the VR Climber from Textrix in Irvine, California. Their 3-D CD-ROM graphics make for aerobic adventures on a Caribbean isle, in a New England town, or among the clouds.

Closer to home is the Exertainment system from Life Fitness of Franklin Park, Illinois. The goal here is to save home exercise equipment purchased with the most earnest of intentions from an all-too-common fate: becoming a very expensive coat rack. Just connect the company's Lifecycle 3500 bike to a Nintendo system to motivate your performance during exercise. The connection kit, bike, and two pieces of software cost $799.

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MARK MATCHO

Factoids

THE INTERNATIONAL Inline Skating Association projects more than 25 million participants in 1995. That's an astronomical jump from 9.2 million in 1992. Inline skates were born in the 1700s, when Dutch skaters attached wooden spools to their skates in summer.

WALKING IS the most popular exercise for Americans who participated in an activity at least 100 times a year. In 1994, 16.2 million folks walked for fitness. Exercise with free weights was second: 11.1 million of us pump iron frequently.

SOURCE: AMERICAN SPORTS DATA INC.

30% OF AMERICAN MALES age 20 and over are overweight. **60%** OF U. S. adults are inactive or exercise infrequently. The Healthy People 2000 program aims to reduce such numbers.

SOURCE: NATIONAL CENTER FOR HEALTH STATISTICS

If the Shoe Fits

USED TO BE, some dress shoes, loafers, well-tamed boots, and a pair of sneakers were all the shoes you'd ever need. Then came "athletic" shoes. For every sport, there's a shoe. No, there are 20. So if you dabble at dozens of activities, do you need dozens of shoes? No way, says Tom Brunick of the Athlete's Foot WearTest Center. Here are his rules of thumb, to help spare your wallet and the floor space in your closet.

A basic tennis shoe, a running shoe, and a specialty sport shoe for whatever is your frequent passion—from soccer to golf to biking—should do the trick for anyone, with the possible exception of Marla Maples and Imelda Marcos.

If, for example, you run or jog with any degree of regularity, you'll need the special characteristics of a running shoe: a durable outsole, or bottom, a flexible, lightweight forefoot, and a firm heel counter and flared heels to minimize rearfoot motion.

Because running entails a repetitive heel-to-toe action and no side-to-side motion, a running shoe is particularly inappropriate for court games like tennis, racquetball, or basketball. Yet a mid-cut tennis shoe could certainly be put into use in an occasional basketball game. Tennis shoes and basketball shoes share some common traits, so they are potentially interchangeable, except for serious players. Both types of shoes have support built in for stability in side-to-side activity. A mid-cut heel provides adequate protection against sprained ankles, though would-be Shawn Kemp's tend to prefer a higher cut than Agassi wanna-be's.

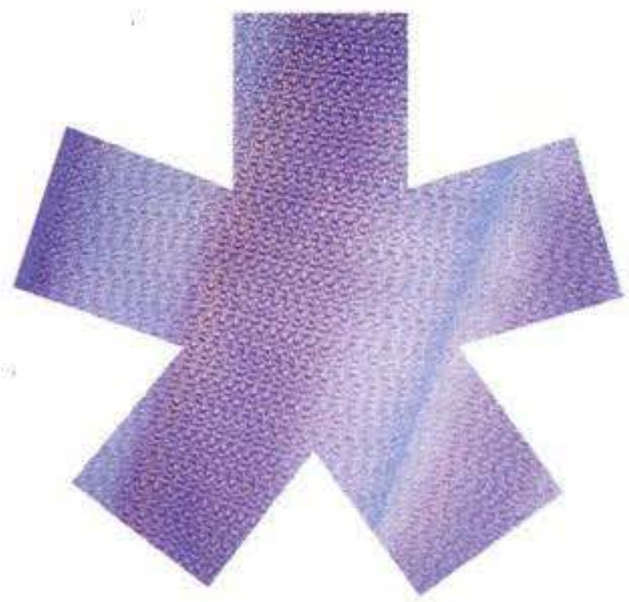
You do need a specific shoe for any activity you perform more than two or three times a week. Make the investment. You'll be less susceptible to injury, feel more comfortable, and the shoe will last longer. Now, if you want to make a fashion statement or keep up with the latest novelty, you'd better clear some floor space in your closet for zebra stripes, gel-filled heels, CO_2-pumps, and removable inner "booties."

High-Tech Togs

WHEN YOU exercise, you challenge your strength and stamina—and your clothes. There are two issues, really: motion and perspiration. DuPont addresses each with high-tech fabrics—such as Lycra spandex and Coolmax—that are mainstays of so-called activewear.

Bending, jumping, or reaching during an intense workout requires a fiber that can move as you do and then recover. Used in combination with other fibers, sleek, flexible Lycra stretches like a second skin.

CoolMax is a lightweight blend of hydrophobic ("water-fearing") and hydrophilic ("water-loving") elements that's grooved on the outside, enabling it to wick perspiration away from the skin so you stay comfortable while you exercise.



CoolMax's cool grooves

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Week In, Week Out—Just Do it!

FACE IT: You need to exercise. And you need to exercise regularly. If you want to achieve and maintain a minimum level of overall fitness, get with this weekly program.

DAILY WARM UP

5 to 10 minutes of exercises such as walking, slow jogging, knee lifts, arm circles, or trunk rotations. Low-intensity movements that simulate movements to be used in the activity can also be included in the warm up.

MUSCULAR STRENGTH

A minimum of two 20-minute sessions per week that include exercises for all the major muscle groups, exerting force over short periods of time. Lifting weights is the most effective way to increase strength.

MUSCULAR ENDURANCE

At least three 30-minute sessions each week that include exercises such as calisthenics, pushups, situps, pullups, and weight training. These exercises should apply continuing force on all the major muscle groups.

CARDIORESPIRATORY ENDURANCE

At least three 20-minute bouts of continuous rhythmic aerobic (activity requiring oxygen) exercise each week, such as brisk walking, jogging, swimming, cycling, rope-jumping, rowing, cross-country skiing, and racquetball.

FLEXIBILITY

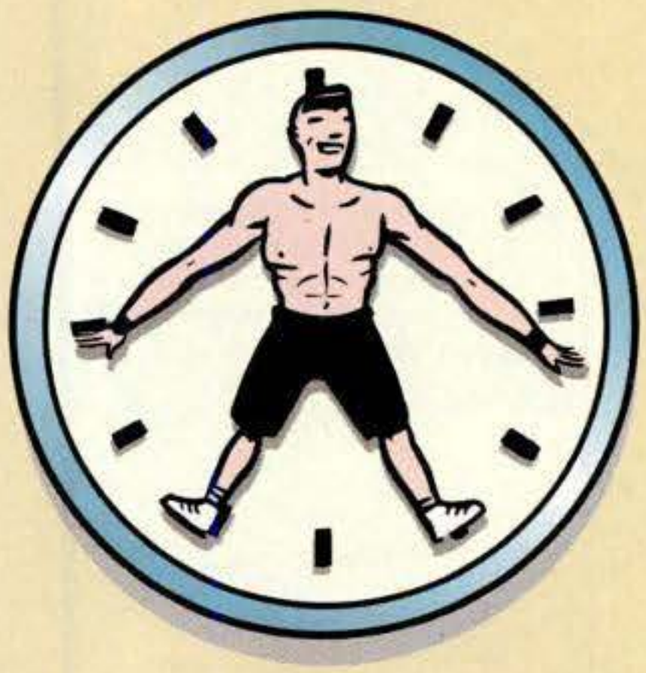
10 to 12 minutes of daily stretching exercises performed slowly, without a bouncing motion. This can be included after a warm up or during a cool down. Such exercises reduce the risk of injury; they help improve posture as well.

COOL DOWN

A minimum of 5 to 10 minutes of slow walking, low-level exercise, combined with stretching. Don't stop suddenly after your exercise is over—you'll risk dizziness if your heart rate and blood pressure drop too quickly.

SOURCE: PRESIDENT'S COUNCIL ON PHYSICAL FITNESS AND SPORTS

60 Minutes to Fitness



Here's one prescription for an effective one-hour workout:

10 mins
Warm up and flexibility (stretching)

20 mins
Muscular strength (weights)

20 mins
Cardiovascular training (jogging, and so on)

10 mins
Cool down (low-level exercise, walking, and so on)

MARK MATCHO

NordicTrack: An American Classic

"SIMPLIFY, SIMPLIFY" urged Henry David Thoreau. Certainly, then, the great 19th century adversary of complication would approve of the original NordicTrack. No frills here. Rather, a straightforward mechanical rendition of cross-country skiing. Since the NordicTrack first appeared nearly two decades ago, more than 2 million consumers have registered their approval of this bare-bones approach to home exercise.

The ski exerciser was invented in the winter of 1975 by Ed and Flo Pauls, ski enthusiasts in search of a training device. The Pauls are to home fitness what the Wright brothers are to aviation. Searching in a salvage yard, they found a flywheel. Actual skis, some pullies, and wires completed the original device. And not all that much has changed since then.

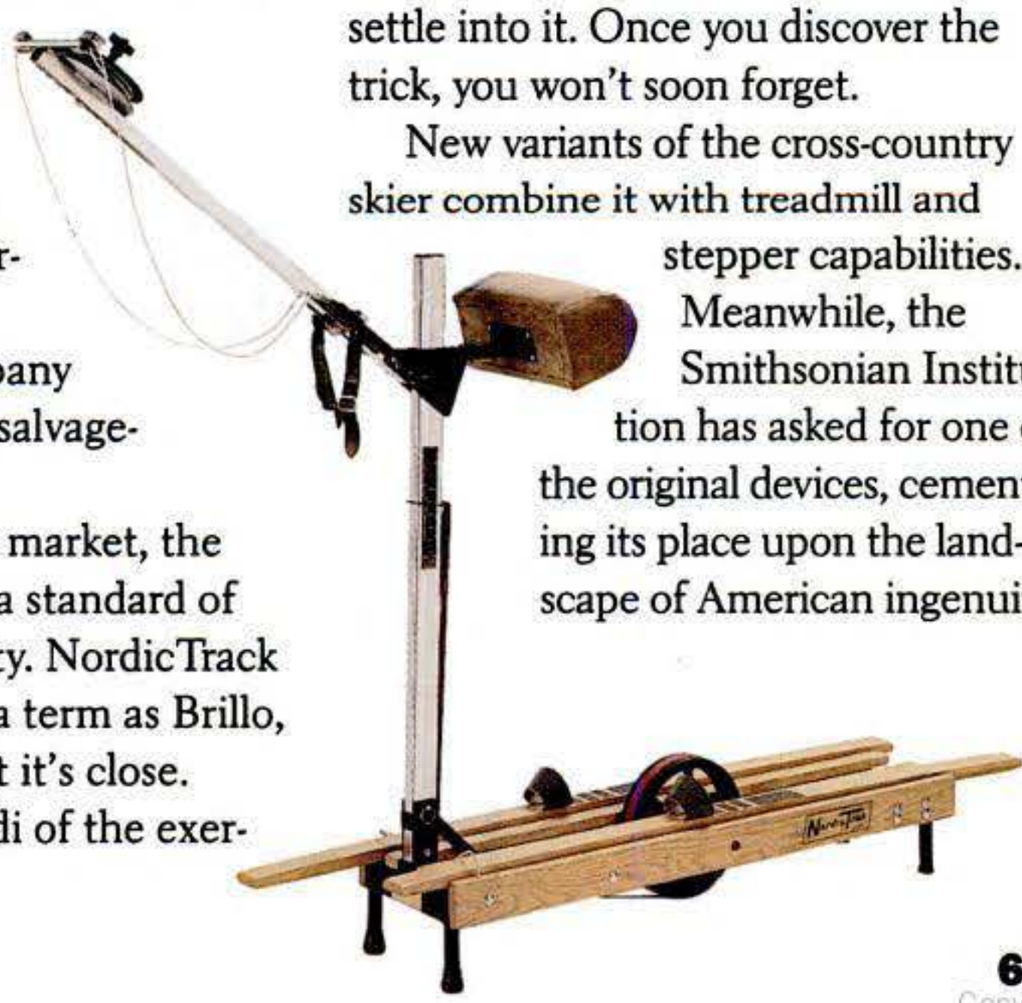
The Pauls' timing could not have been better, since the burgeoning fitness boom of the 1970s was reaching full blast. Twenty years later, some 60 products, including multiple-exercise variants of the original NordicTrack, have been developed by the company spawned by the Pauls' salvage-yard contraption.

In the home fitness market, the NordicTrack stands as a standard of simplicity and ingenuity. NordicTrack may not be as generic a term as Brillo, Jello, or Styrofoam, but it's close.

The modus operandi of the exerciser can be grasped near-instantly. You move the long, thin slatted boards much as you would skis; strings on a pulley give the feel of poles.

Just like a first-timer on a beginner's slope, you may find yourself lurching spastically on your first few efforts. The key is to relax, find a groove, and settle into it. Once you discover the trick, you won't soon forget.

New variants of the cross-country skier combine it with treadmill and stepper capabilities. Meanwhile, the Smithsonian Institution has asked for one of the original devices, cementing its place upon the landscape of American ingenuity.



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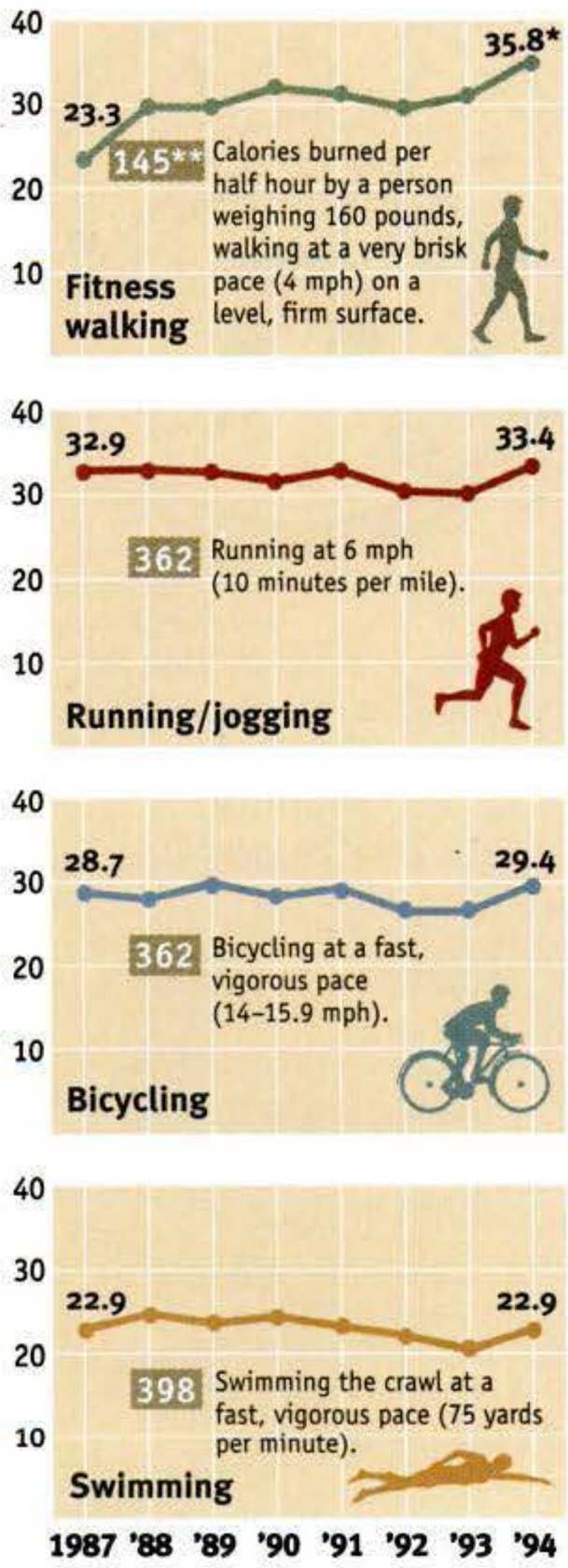
The Great Outdoors

THESE staples of outdoor exercise are efficient calorie burners.



* SOURCE: AMERICAN SPORTS DATA INC.; PARTICIPANTS AT LEAST ONCE YEARLY, IN MILLIONS
** SOURCE: BARBARA E. AINSWORTH ET AL, "COMPENDIUM OF PHYSICAL ACTIVITIES," OFFICIAL JOURNAL OF THE AMERICAN COLLEGE OF SPORTS MEDICINE, SEPTEMBER, 1992

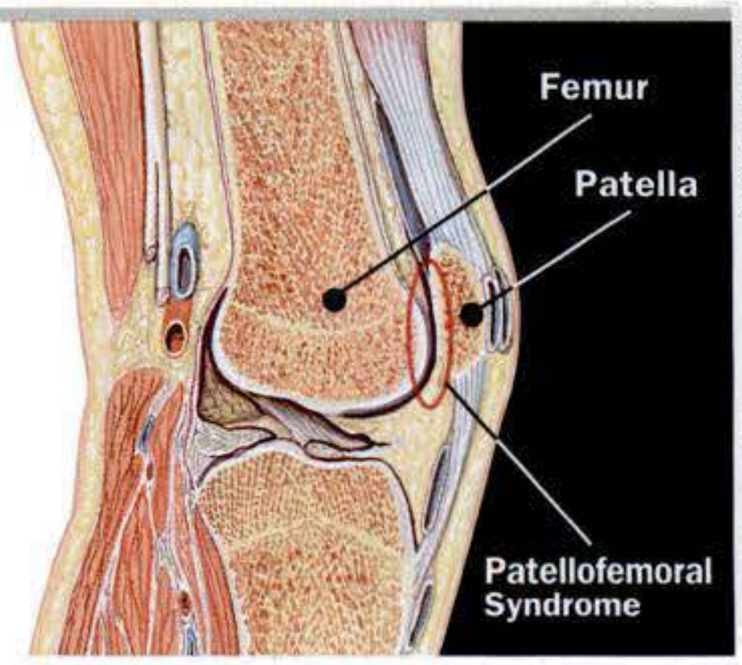
Exercise Lite

NO PAIN, NO GAIN? This motto makes an end run around the facts, and it may be demoralizing to anyone willing to exercise at a moderate level.

National health officials are now stressing a concept called "Exercise Lite." The idea? People are more likely to adapt to and stick with less intense, less time-consuming exercise programs. Citing evidence that regular, "moderately intense" physical activity provides substantial health benefits, including a decreased risk of coronary heart disease, a new program called Healthy People 2000 recommends that every American adult accumulate 30 minutes or more of moderate-intensity physical activity every day.

What constitutes moderate intensity? Activities such as walking up stairs, gardening, raking leaves, dancing, and walking briskly can contribute to the 30-minute total, according to the American College of Sports Medicine. For the 24 percent of adult Americans described as "completely sedentary," even relatively small increases in activity are beneficial.

Preliminary reports indicate that the country is making progress toward two-thirds of the goals set.



MOSBY/THIBADEAU

The femur irritates the rear of the patella, causing the condition known as "runner's knee."

Watch the Knees

ANY LIST OF common exercise-related injuries is sure to include runner's knee. The phrase most often refers to patellofemoral syndrome—pain in the back part of the kneecap. Runner's knee may be caused by overexercising, structural problems, or improper footware. For doctors such as John Hefferon, team physician of the Chicago Bulls, and Stephen Nicholas, associate orthopedist for the New York Jets, it's the injury they see most frequently in their private practices.

Whether you consult a high-profile sports medicine doctor or a local practitioner, the prescription for preventing runner's knee is likely to be strengthening and stretching exercises, especially for the quadraceps. ◆

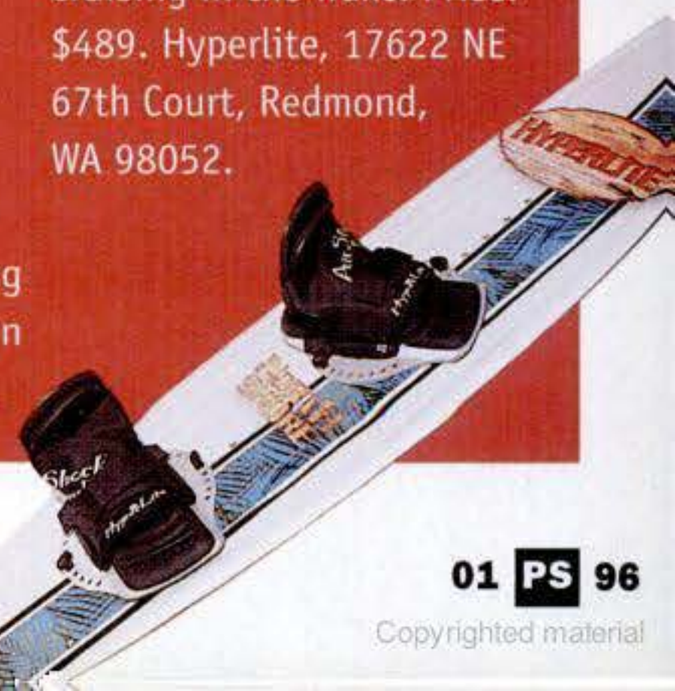
Cool Stuff

LOOK like you're in motion when you're standing still. Oakley's Full Metal Jacket Iridium-coated glasses are ultra-effective at reducing glare and increasing detail. The earpiece's soft rubber coating reacts to moisture to hug your head. Price: $125. 10 Holland, Irvine CA 92718.

INPUT YOUR walking and running stride lengths, height, and weight, and the $40 N-Ergetic fitness monitor displays distance and calories burned. K&R Instruments, 1933 Premier Row, Orlando FL 32809.

WANT TO skate part-way to work, then take public transportation? Blox In-line Skate Guards let you hop on the bus without switching shoes. $15. Blade Blox, 744 Queen St. W., Toronto, Ontario M6J 1E9.

FIRST THERE was skateboarding, then snowboarding, now wakeboarding. Slip into the neoprene boots, hang onto a tow rope, and tell the boat driver to hit it. Now you're cruising in the wake. Price: $489. Hyperlite, 17622 NE 67th Court, Redmond, WA 98052.



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ATTENTION HOMEOWNERS!

- **Differential Steering** pivots 360° in its own length.
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7 year
WARRANTY

Single-point height adjustment raises/lowers cutting height instantly, infinitely.

4 forward speeds, neutral & power reverse for fast and efficient maneuvering.

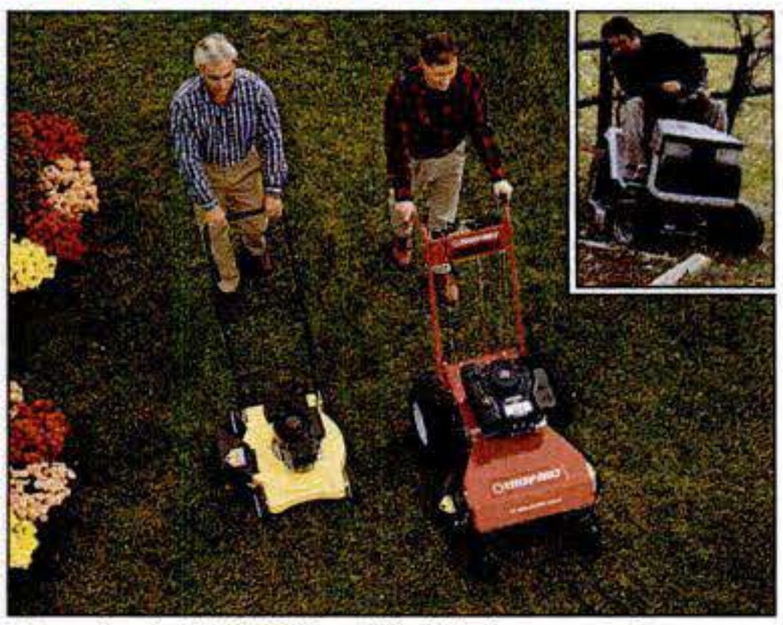
Extra-wide 33" deck covers ground fast — the same as used on big riding mowers.

BREAKTHROUGH TECHNOLOGY CUTS MOWING TIME IN HALF!

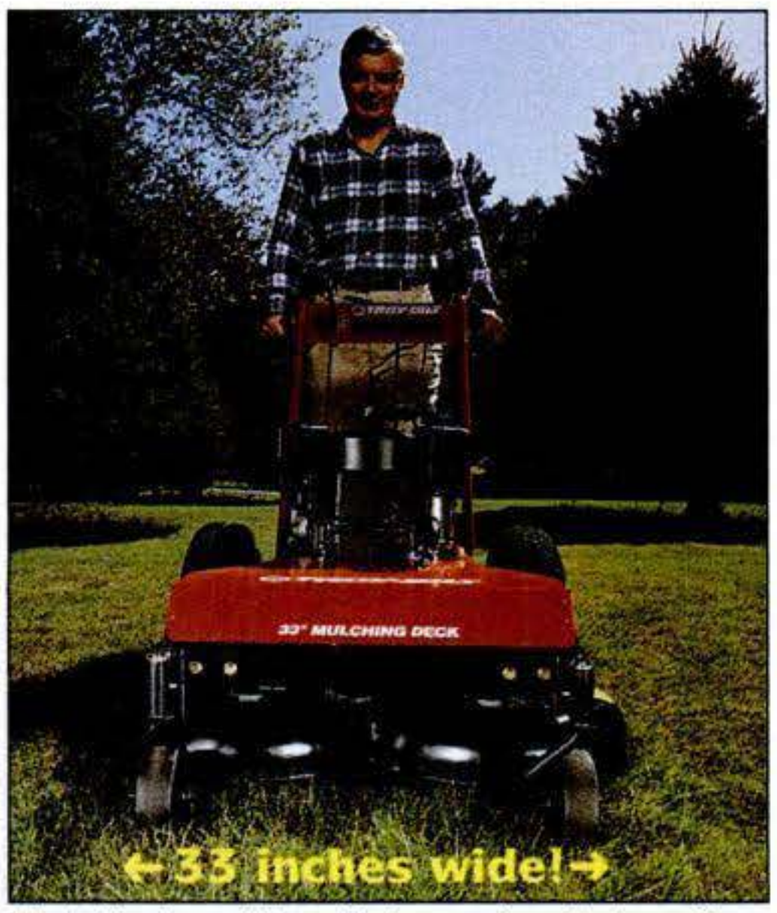
The TROY-BILT® WIDE-CUT Mower finishes the job in half the time ordinary walk-behind & riding mowers take!

The unique TROY-BILT® WIDE-CUT Mower is a revolutionary HIGH-SPEED way to mow, finishing your lawn in half the time...and giving it a beautiful, high-quality cut, too!

Professional-style technology... at a homeowner price!



America's FASTEST walkbehind mower, the TROY-BILT® WIDE-CUT Mower is 50% wider than ordinary mowers, and far more nimble than riding mowers!



Twin-blade mulching deck recycles clippings & leaves, cuts almost a yard wide!

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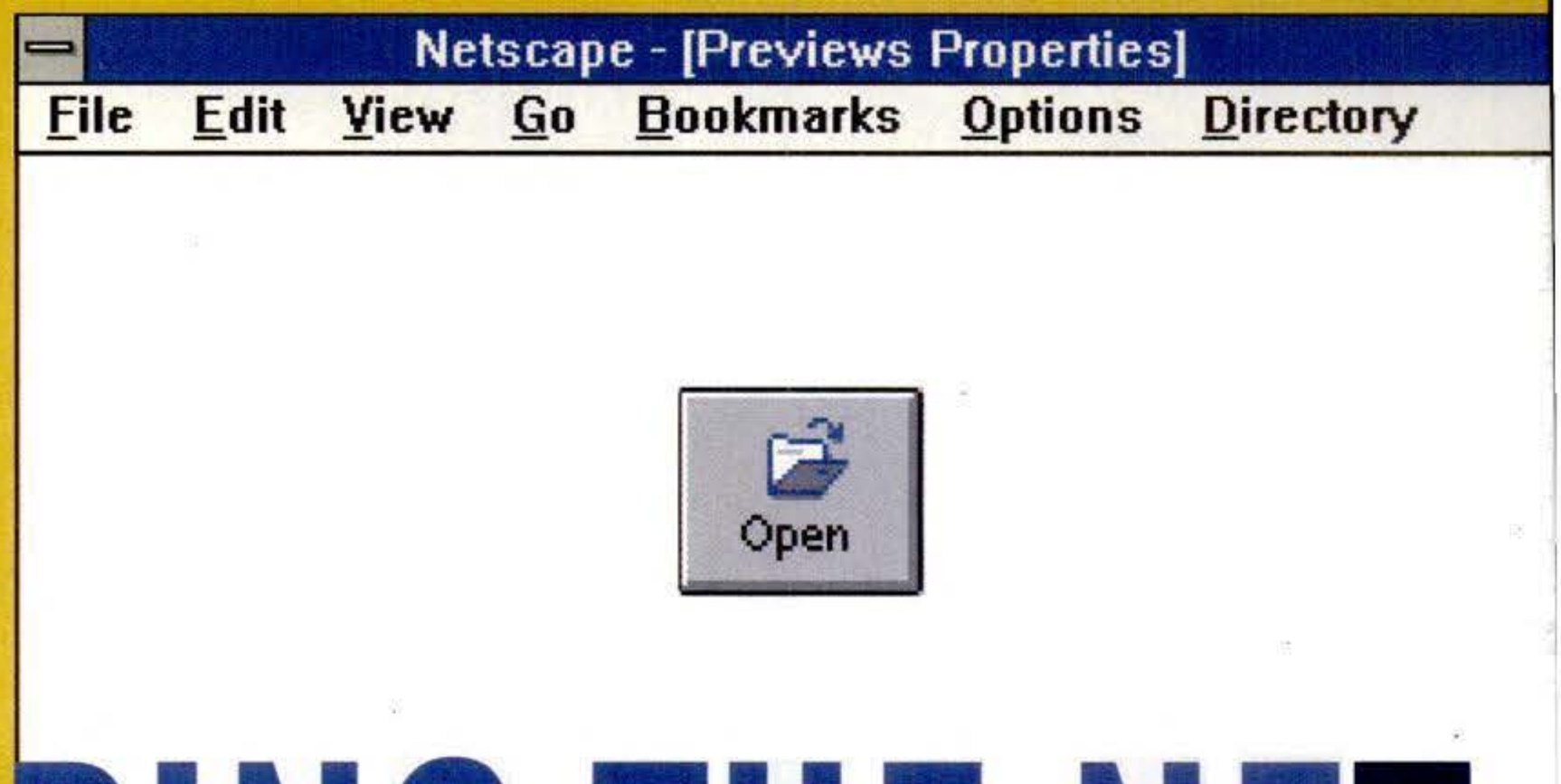
We went on an online buying spree. Well, browsing spree.

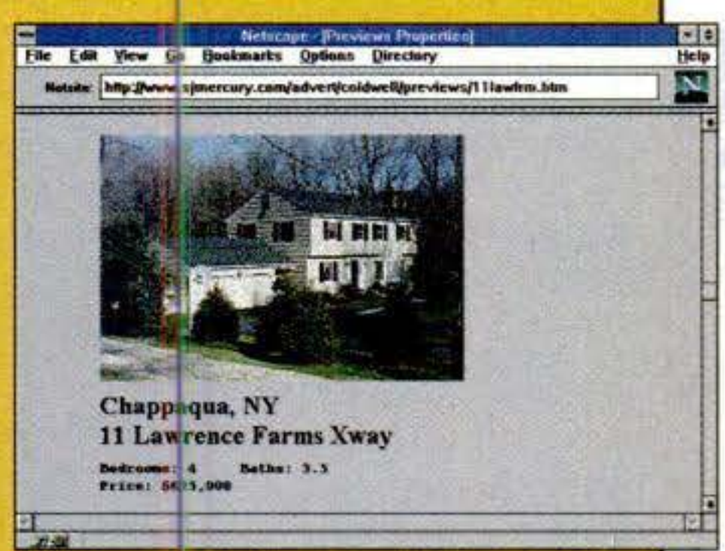
SHOPPING THE NET

BY LOUIS ERICSON



DRIVE TO THE STORE? Wait by the mailbox for a catalog? Why bother? The Internet's World Wide Web is the modern marketplace. You can sit down at your computer and quickly find what you want, when you want. Or so the cyberspace sales pitch goes.

You'll have to search before you shop with indexes like Yahoo.



In theory, you can shop for anything on the World Wide Web—even a house.

Can this shopper's paradise be real? I decided to find out. My mission is simple (and enviable): Spend money. I draw up a list of life's basics, ranging from life-changing purchases to pocket-change niceties. My shopping list includes a house, a car, a vacation, a computer, a compact disc, groceries, a bottle of wine, and a birthday gift.

Can you even buy such things online? Are they any less expensive? Is it any more convenient? Armed with Netscape Navigator browsing software on my PC, and hooked into the Web via the CompuServe network and a 14,400bps modem, I am going cyber-shopping.

I don't really expect to buy a house on the Web, but I'd like to find out what's for sale in Westchester County, just north of New York City. But my house-hunting quickly becomes a primer on the disorganization of the Web, which more resembles a crazy quilt than a carefully woven spider's web. There is no directory or table of contents, much less a real estate section.

So to find some houses, I have to rely on the kindness of strangers in the form of unofficial Web indexes and assorted other online sites that include point-and-click links to related pages. **I start my search by typing in "house" on the Yahoo page, a popular Web searcher.** Yahoo finds 424 matches—many of them having nothing to do with real estate—but none lead me to Westchester listings.

But another index, the Whole Internet Catalog, leads me to something called the Internet Real Estate Directory. Merely by clicking on the directory's highlighted name, I'm transported to the right computer, the Web's routine minor miracle. The Real Estate Directory turns out to be a chatty, opinionated list of Web real estate listings—none of which prove very useful. **Eventually, the Catalog's references lead me to three houses listed by a Coldwell-Banker agency in Chappaqua, New York.** But the three "luxury properties" are a little too luxe for my wallet: The cheapest sells for $625,000.

Ready to give up, I find an online agency, the William B. May Company. The Web site describes 27 houses,

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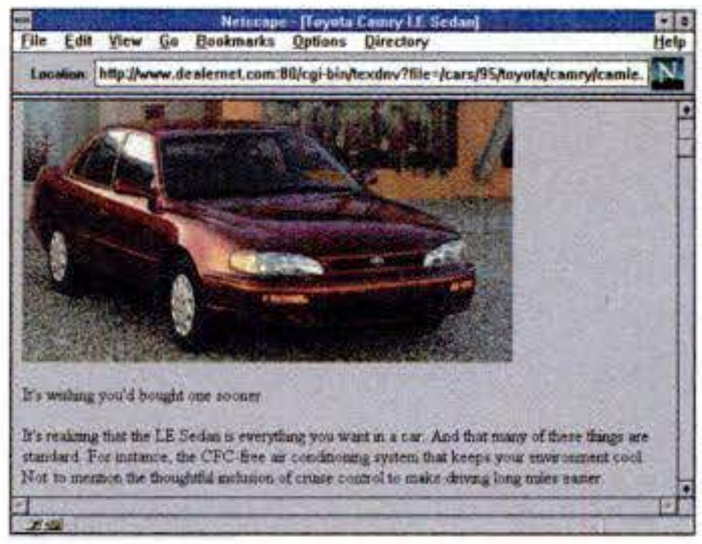
many of which are in the Westchester towns of Irvington and Ardsley. A gold mine by online standards, but it took me two frustrating hours on the computer. The real estate section of the Sunday *New York Times* sitting beside me lists about 400 houses.

I'm not sure I want to purchase a car on the Web, either, but I'm more optimistic about my chances. I quickly find a car broker called Auto Connection that lets you fill out a form to order the new or used car you want: year, make, model, color, and so on. The company then sends you a sales contract with a nearby dealer. But, as in real life, I want to do the legwork myself.

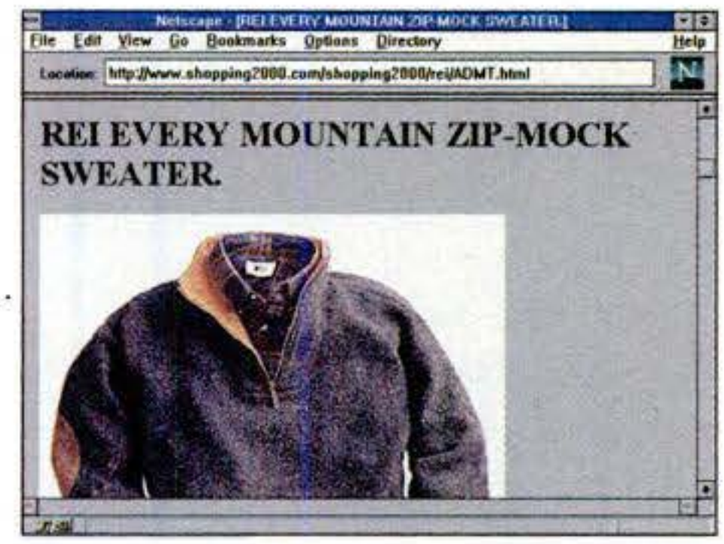
Another search on the Yahoo page yields lots of irrelevant sites and one bull's-eye called DealerNet. It's a kind of clearinghouse for manufacturer-supplied information about nearly any new car you could want to buy—from Acura to Volvo. **I'm interested in a Toyota. DealerNet has electronic brochures for all of the 1995 Toyota models. No sales, but solid info.**

Used cars are trickier. Several businesses offer listings, but their inventories are thin and their locations are geographically wide. I do spot an intriguing listing for a $9,900 1982 DeLorean, but before I can give in to that temptation, I spy a site dubbed The Webfoot's Used Car Lot. The "lot," run by a woman who also posts essays, such as "What I Learned from Shaving My Head," on the page for no apparent reason, features 55 cars for sale in the northeastern United States. No suitable Toyota here, either, but a prime example of the earthy volunteerism and unearthly strangeness that makes the Web such an interesting place.

The money's beginning to burn a hole in my electronic pocket, so it's on to buy something I'm pretty sure I can find online: a sweater. As I



Like many Web sites, DealerNet is short on buying options but long on information.



Will the color on your screen be the same color on the sweater that arrives? Not always.

hunt for the right size, the challenge isn't simply finding what I want—it's knowing exactly what I've found. At a site for Shetland Knitwear Associates in Scotland, I'm interested in what appears to be a sky-blue Fair Isle Trim Sweater (39.75 pounds sterling) pictured in their online catalog. But the caption beneath the photo reads "lovat green." Which is right? Their caption or my computer?

Confused, I move along to an online shop run by a company called Winona Inc. Its sweaters feature preppie duck designs, and you can get a good look: The Web page displays small color photos of the sweaters, and clicking on one brings a larger photo that lets you see the knit as well as the color. I'm not in the mood for mallards, but encouraged to shop onward.

Finally, I settle on a zippered turtleneck from the online version of the REI catalog. Here, too, the colors aren't entirely clear, but I'm ready to order anyway. It costs $69.90, including shipping and tax.

Remarkably, though, I can't order it online. Instead, I have to dial REI's 800 number. Worse still, the woman who answers has no clue what this Web thing is. Eventually, we determine it's an item from their winter catalog—her only frame of reference.

When the sweater arrives by UPS a week later, it's a brownish black, not the far lighter color it appeared on the screen. But I'll keep it. Which later proves just as well: REI disappeared from the Web in weeks following my shopping. Many of these Web sites seem to have the shelf life of bananas. Or grow like weeds. Lands' End, the popular catalog clothier, has since opened its first Web site.

I'm a little more particular about my computer's specifications. At the Internet Shopping Network (an online subsidiary of the Home Shopping Network), I browse through a long list of notebook computers. One strikes my fancy; it reads: ACERNOTE 760, 486DX2-50, 340MB-HD, 4MB, 1.44-FD, D.SCAN. I know enough computerese to translate that into a AcerNote laptop with a 50MHz 486 chip, a 340MB hard drive, 4MB of memory, a 1.44MB floppy disk drive, and a dual-scan color screen. But it still leaves me with lots of questions: How much does it weigh? How large is the screen? What software does it include?

There's no picture of the computer on its "information page," and no screen measurements. And the official weight listed is 13 pounds—obviously a mistake in this 5- to 7-pound era.

Eventually, I find another AcerNote notebook I like on the Network. This one has a 486DX4-75 processor, 8MB of memory, and, I thankfully note, a 9.5-inch color screen. It costs $1,972.46 before taxes and shipping. I deem it a pretty good deal, since Acer

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How Safe is Buying Online?

IF YOU thought you'd be mugged in the parking lot of your local mall, you probably wouldn't rush out to go shopping. Shopping on the Internet doesn't pose any physical hazards, but the security and privacy of electronic transactions is still an open question.

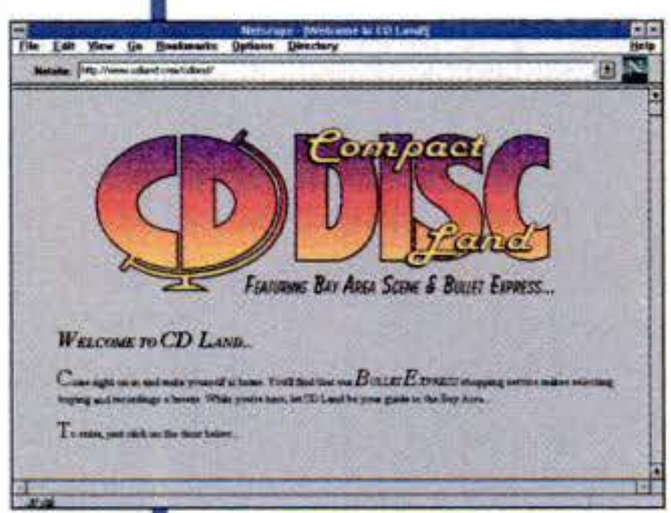
One antitheft measure, called the Secure Sockets Layer or SSL protocol, is already integrated into the popular Netscape Navigator browsing software from Netscape Communications. Using encryption techniques, SSL attempts to create a secure conduit between computers so no one can take a look at the information in transit—which would include your credit card number and expiration date. SSL has not proven impenetrable, however, and there are a number of other pro posed solutions.

One, called Secure HTTP or S-HTTP, addresses not only privacy, but also issues such as "authentication" (verifying that each party in a sale is who they claim to be). Several key figures in the online arena—including Netscape, CompuServe, America Online, and IBM (a co-owner of Prodigy)—are trying to shape SSL and S-HTTP into a single security standard.

But, at this writing, Visa and Mastercard are pursuing their own routes to secure online transactions. And Verifone, the credit-card authorization company used by most retailers, has an online system of its own. In the near term, the result of these many efforts will likely be continued uncertainty about buying online.—*L.E.*

America itself is selling the same model with only 4MB of RAM for $1,999. I click on the Order button, which brings several screens asking me to confirm my intent to buy and then presents an itemized bill. I had earlier supplied my credit card information in becoming a "member" of the Internet Shopping Network. (Members can buy; others can merely browse.)

Later, I get two separate confirming e-mail messages—as if I'd ordered two computers. That mistake rectified, another miscue becomes apparent when the computer arrives: It has only 4MB of memory. I send an urgent e-mail message to Internet Shopping Network. They respond in kind, admitting their description was too good to be true. Internet Shopping Network agrees to take back the system. The whole experience leaves me a little gun-shy about buying big-ticket items online. I scratch the computer from my list and move on.



CD Land has a great selection of compact discs, but few great deals.

Even the most familiar brand names don't necessarily spell a rewarding shopping experience, as I discover shopping for music CDs. Entering the Web site for Tower Records, I'm expecting a wide selection and maybe some online salespeople. Using Tower's search form, I look for CDs by the jazz musician Sun Ra. In response, I get a garbled printout containing variations on this helpful little message: SCORE: 1000, LINES: 33, BYTES: 1435. Then, without warning, Tower's computer starts downloading a huge file—I can't see what it is—

onto my computer. I soon lose my patience and curiosity, and hit the Stop button to cut it off. I try again, only to get the same digital dizziness.

Making my escape from this Tower of Babble, I wind up at a place called CD Land, which claims to have 137,000 recordings and indeed has 28 of Sun Ra's. I order one. A week later, the disc comes in the mail. It cost me $18.98, shipping included. Not a great deal, I later learn. The Tower Records store—the on-land kind—that sits a mile and a half away from my home had the same disc for $17.30, tax included.

Well, if the Web isn't always the best deal, it's the fastest way to shop, isn't it? Not necessarily: As I learn when buying groceries online, ordering is one thing—delivery is another. The only Web store I can find resembling a grocer is American Supply International, which caters mostly to Americans abroad hungering for homegrown staples like Froot Loops, Pringles, and Cheez Whiz. But ASI also delivers in the United States, so I order a $34 care package with all the essentials: Doritos, canned tuna, Raisin Bran, and assorted other yummies.

Don't order on an empty stomach. It took nine days for ASI to get my order out the door, and about a week more via parcel post to arrive at my doorstep. As you might suspect, ASI doesn't sell perishables. But my purchases seem to get easier, even pleasurable, as I go down my list. Indeed, my online wine merchant, Virtual Vineyards, is worthy of a B-school case study in how to conduct business over the Web—at least in comparison to other Web sites.

The Virtual Vineyards site offers something few others do: guidance. It singles out monthly specials. It has sampler packs of Cabernets, Chardonnays, and medium-bodied reds. It has a special button to limit your search to wines under

$15. And it has copious descriptions of each wine it carries—far more helpful and believable than your usual liquor-store employee.

My curiosity is piqued by a Pinot Blanc from Domaine St. Gregory, so I investigate. I read a short review brimming with wine talk like "full malolactic fermentation."

I'm sold. I drop the wine into my virtual shopping basket and head to the check-out page, a secure credit card order form. I try not to think about the shipping charge, which runs $7.89 for the $12 bottle of wine. Fedex delivers it two days later, in a box discreetly labeled "Virtual" but not "Vineyards."

Planning a vacation on the Web is a little more haphazard, but it can be done—especially if you've got flexible plans. I've got Mickey on my mind, but nothing too specific beyond that. **After cruising random destinations ranging from Hawaiian resorts to Scottish getaways, I end up at TravelWeb, a clearinghouse for hotel chains. TravelWeb leads me to Disney World.**

The Disney site has a calendar of events at its Florida theme parks and detailed descriptions of its hotels, including prices and a picture (with measurements) of a typical room. I pick Disney's All-Star Music Resort and fill out a form with my name and arrival/departure information. The next day, a clerk from Disney calls to review the details.

Renting a car from Alamo is a snap, once I find the company through Yahoo's index. Using Alamo's form, I enter the dates for my Orlando vacation and pick "Economy Car–Four Door." The Web page quotes me a price of $67.76 for four days. I accept, and the company's system spits out a confirmation number.

For tickets, I try a company called PC Travel, which I wander into through Yahoo. On the Web for less than a month when I check it out, PC Travel is not yet at full speed. For my Orlando trip, I request the lowest-priced tickets that are refundable without paying a penalty. A series of forms and confirmations lead me through my itinerary, giving me a selection of flights and carriers near the times I request. I order a pair of tickets online Wednesday night, priced at $366 apiece for the round trip. I get the tickets via Fedex on Friday. Everything's fine.

But then I notice that the words "Ticket Non Refundable" are printed on each of the coupons. Panicking, I call PC Travel. A helpful agent cancels the ticket and theorizes there's a problem with the way PC Travel's computer codes New York-Orlando flights. She'll fix the status.

My final purchase is a birthday gift for my wife. Ordinarily, I'd head to the mall, so I start wandering through the various Web malls looking for interesting stores. But these Web malls tend to group companies and products that are impossible to imagine together in a real-world mall. At the Web's iMall, for instance, you can buy stun guns and Brigham Young University T-shirts, but there's no Sears or J.C. Penney. At the Internet ShopKeeper, you can buy Tupperware and a condom-vending machine. Again, no department stores. At the Empire Mall, one store sells personalized mouse pads, while another sells jet-aircraft consulting.

Oddities abound. For the sake of marital peace, I resist the urge to buy her a mailbox in the shape of a dolphin, or one of the many food baskets with names like Carolina Swamp Stuff and Chile Today/Hot Tamale. And there's enough gourmet coffee on the Web to keep you up at night: Maui Coffee Company, Harvard Espresso, and Java Byte are but a few of the joe choices.

Not making any progress, I switch gears. No doubt my toddler would like an early birthday surprise from one of the toy stores I've spied in my online travels. A few minutes browsing in the Grand River Toy Company's Web catalog and I find just the thing for my beloved little noisemaker: four jingling bells attached to a Velcro band that he can wear on his wrist or ankle.

The bells arrive a few days later. I shake the bells for him; he doesn't seem interested. I strap them around one wrist; he fights to pull them off. Why should I be surprised? It's not the first time the bells and whistles of World Wide Web shopping have disappointed me.

WEB SITES MENTIONED IN ORDER: **Yahoo** http://www.yahoo.com/ **Whole Internet Catalog** http://gnn.com/gnn/wic/ **Internet Real Estate Directory** http://www.onramp.net/ired **William B. May Co.** http://www.hia.com/hia/wbm/ **Auto Connection** http://www.automart.com/ **DealerNet** http://www.dealernet.com/ **The Webfoot's Used Car Lot** http://www.webfoot.com/ lots/international.car. lot.html **Shetland Knitwear Associates** http://www.zetnet.co.uk/ska/ **Winona Inc.** http://www.mps.org/~winona.inc/ **Lands' End** http://www.landsend.com/ **Internet Shopping Network** http://www.internet.net **Tower Records** http://www.shopping2000.com/shopping2000/tower **CD Land** http://www.cdland.com/cdland/ **American Supply International** http://www.dgsys.com/~asii/ **Virtual Vineyards** http://www.virtualvin.com/ **TravelWeb** http://www.travelweb.com/ **Alamo** http://www.freeways.com/ **PC Travel** http://www.pctravel.com/ **IMall** http://www.imall.com/ **Internet ShopKeeper** http://www.ip.net/shops.html **Empire Mall** http://empire.na.com/ **Grand River Toy Company** http://www.cheetahs-gold/com/

TravelWeb can take you places online, including Disney World.

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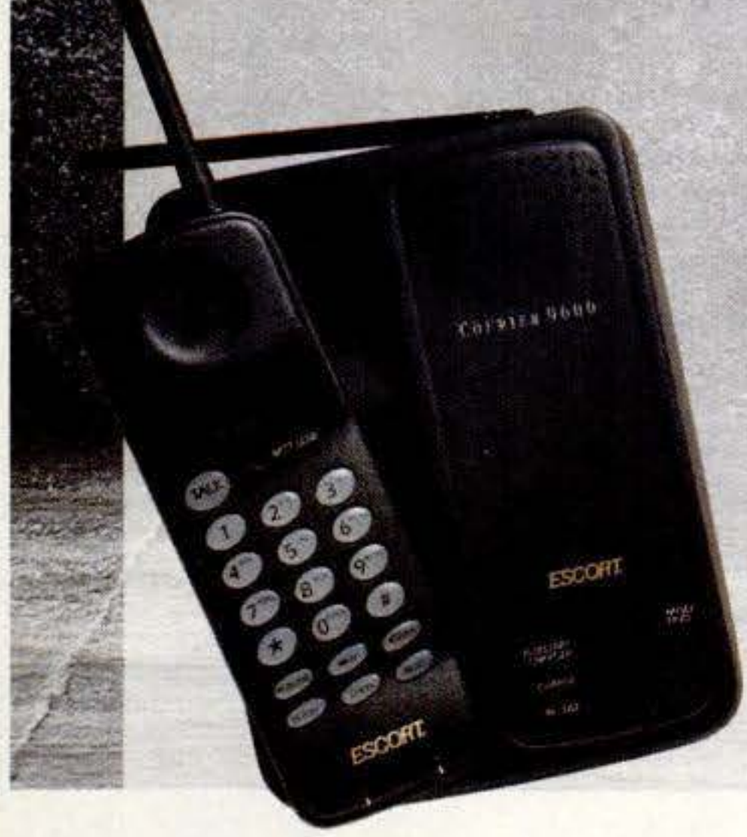

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FYI

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ASK POPULAR SCIENCE

How do spiders start spinning their webs without snagging that first, key strand? Also, the supply of silk seems endless; is it?

William Bell
Springfield, Ore.

THE approximately 36,000 spider species employ many web-building techniques. Your question seems to address orb weavers—the varieties of spiders that make geometrical webs with a hub, radii, and sticky spiral. Sometimes they're also called garden spiders, though spiders generally haven't been given common names.

A grim-looking orb weaver.

AMERICAN MUSEUM OF NATURAL HISTORY

Orb weavers begin a web in either of two ways, says Norman Platnick, a curator in the Department of Entomology at New York's American Museum of Natural History. Silk from the spider's spinners floats free until it sticks to something. Or, the spider may affix silk to one spot, descend to the ground trailing the taut strand, and climb up to the next point.

The silk supply appears inexhaustible, but it isn't, says Platnick; many orb weavers take down the web each day, consume the silk, and recycle it.

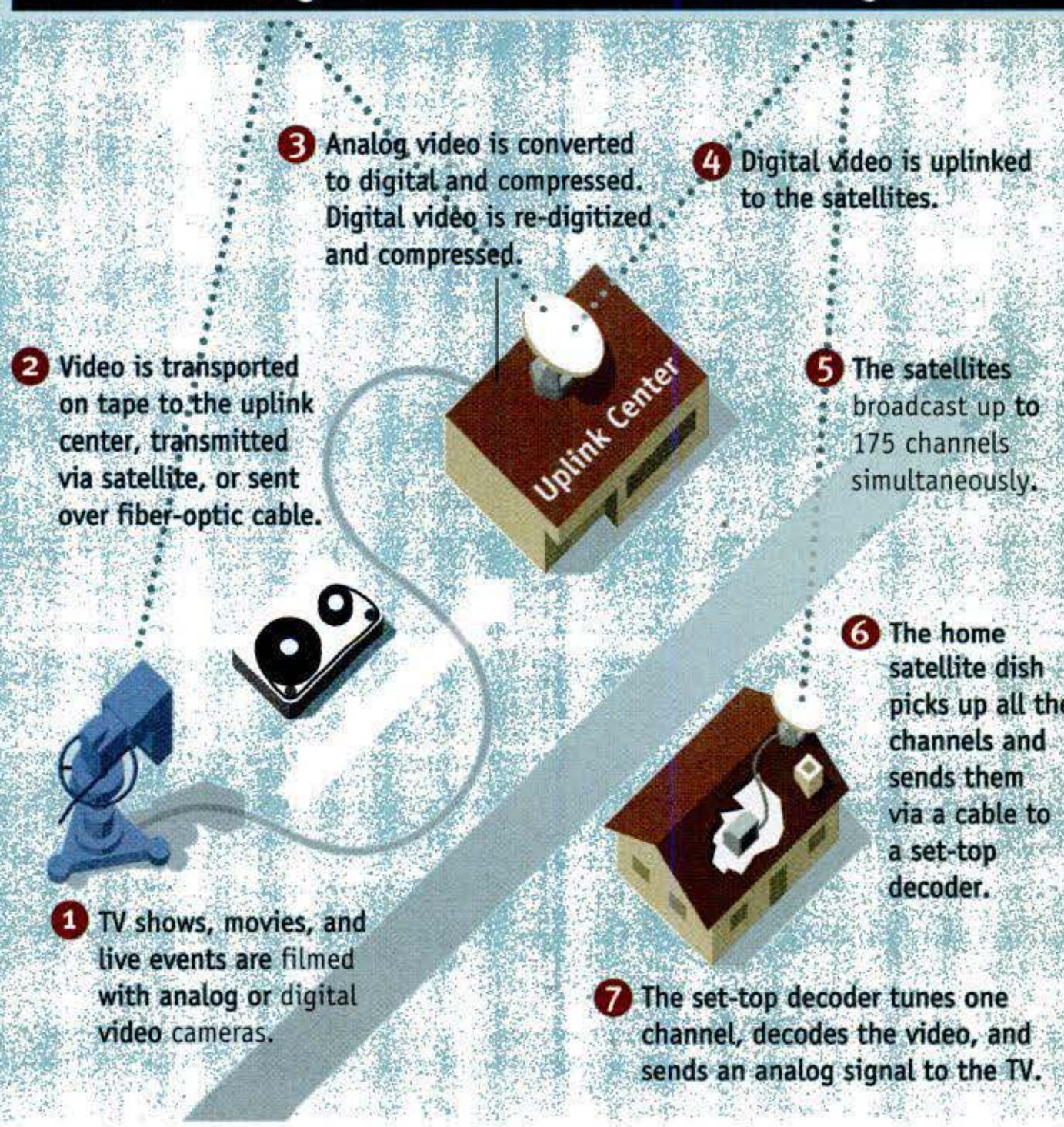
The webs are strong and flexible. Says Platnick: "Spider silk has greater tensile strength [ability to stretch without breaking] than steel strands of the same diameter."

ALEX REARDON

HOW IT WORKS

Small Satellite Dish Service

MORE THAN ONE MILLION U.S. residents have installed small TV satellite dishes. Joining these growing ranks requires a choice between the RCA/Sony DSS 18-inch dish and PrimeStar's slightly larger dish. Ordering the PrimeStar service is similar to receiving cable: After you place your order, a technician installs the dish and activates programming. RCA/Sony gives you the option of installing the DSS yourself. The dish must be placed so it can capture a clean signal from the nearest satellite—the best spot is usually on the roof, facing south. DSS dishes receive USSB and DirecTV preview channels as soon as the dish is hooked up. To activate service, call the programming provider and give your unique satellite dish address.—*Suzanne Kantra Kirschner*



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The web builders you've seen have likely been female, by the way, which tend to be substantially larger than adult males. Juvenile males also build webs. But after maturing, the main goal for the balance of the male orb-weaver's short, several-week life is to find a mate.

How much faster can microprocessors get? Can they hit an "absolute zero" point at which they perform tasks in no time at all?

Brian Decker
102342.3370@compuserve.com

NO. LOGIC dictates that the performance of any task require some measure of time, however infinitesimally small.

So, as fast as microprocessors get, there's no "zero" point. Also, as a practical manner, the tasks microprocessors are asked to do are not fixed, finite exercises with clearly defined start and end points—like a 100-yard dash. Rather, the job of executing a software program's instructions is more like keeping up with an assembly line that gets longer and moves faster every year.

That said, the performance of today's microprocessors is astounding. One estimate holds that, at a rate of one calculation per second, it would take a person more than two years to perform the same number of operations a modern microprocessor can do in a single second. And these chips are getting faster at a remarkable rate. A theory called Moore's Law states that the speed of microprocessors will double every 18 to 24 months. Lately, it's more like 15 months.

Still, the demands on a microprocessor have grown at least as quickly. The real-time audio and video in many multimedia titles, for example, puts a heavy burden on PC processors. So do the many telecommunication functions PCs are now handling. The complexity of standard business applications grows with each new release. And updated operating systems such as Windows 95 can increase the load exponentially.

In fact, to keep pace with this more sophisticated software, microprocessor makers are looking beyond simply increasing the chip's operating frequency—measured in millions of cycles per second, or megahertz—or widening the data highway leading to the chip from, say, 16 to 32 bits. The PowerPC chip, for example, uses a "reduced instruction set" to do the same work with fewer operations. The Pentium chip has two separate execution pipelines (it's essentially two microprocessors working together), and even tries to prevent delays by predicting the flow of software instructions. Intel's new Pentium Pro chip takes the process to a new level with three separate engines that continually work on a "pool" of software instructions rather than tackling them one at a time.

You mention a Volvo 850 with a five-cylinder engine in your June 1995 issue. Just what kind of engine design uses five cylinders, and what advantages does it have over a four or six-cylinder engine?

James McMurrin
Harrison, Ark.

VOLVO'S five-cylinder engine is essentially a shortened version of the inline six that is mounted longitudinally in the company's rear-drive models. Because the engine is mounted transversely to drive the front wheels, Volvo lopped off one cylinder to fit the engine sideways in the 850 model.

The five was chosen over a four because it is more powerful. Volvo's 2.3-liter four-cylinder engine develops 114 horsepower; the 2.4-liter five produces 168 hp—but a turbocharged version of the five-banger develops a prodigious 240 hp.

If I live far from a big city or town, where can I dispose of the used oil from my car?

Bob Mitcheff
ram2@spaceworks.com

ACCORDING TO Frank Bronstein, executive director of the United Association of Used Oil Services, most counties have designated disposal areas. And many auto-parts stores and gas stations serve as collection depots. You should call your county government to find out the easiest solution in your local area.

Newspapers have recently reported that people have been killed by bullets fired up in the air that fall back to earth. Is this possible?

Jim Spencer
Lexington, Ky.

POINTING AND shooting a gun skyward endangers anyone in the area. Having gone up, a bullet must come down. How fast the projectile descends depends on its caliber, whether it tumbles or not, and if it falls nose- or blunt-end first.

Fired upward at a typical muzzle velocity of about 2,700 feet per second, a bullet can climb two miles and remain in flight for more than a minute. As it falls, the bullet accelerates to a terminal velocity of 300 to 700 feet per second, at which point its aerodynamic drag equals the force of gravity and it can travel no faster.

Bullet velocity of 200 feet per second is sufficient to penetrate the human skull. Most of the random victims of shots aimed at the sky are struck on the top of the head, shoulders, or upper back. Doctors at King/Drew Medical Center in Los Angeles have reported treating 118 people for falling-bullet injuries from 1985 through 1992, 38 of whom died. Holiday weekend revelers fired the shots.

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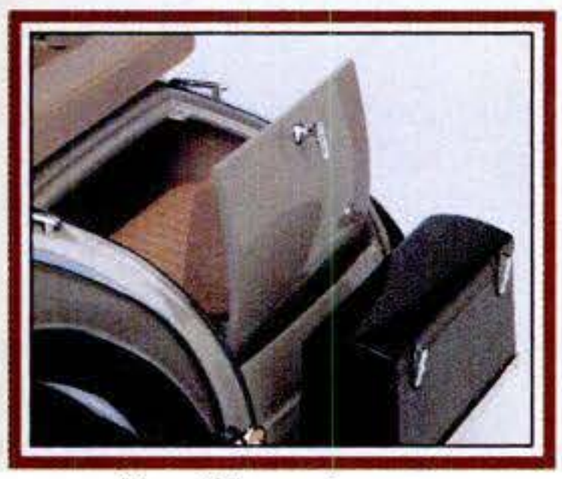
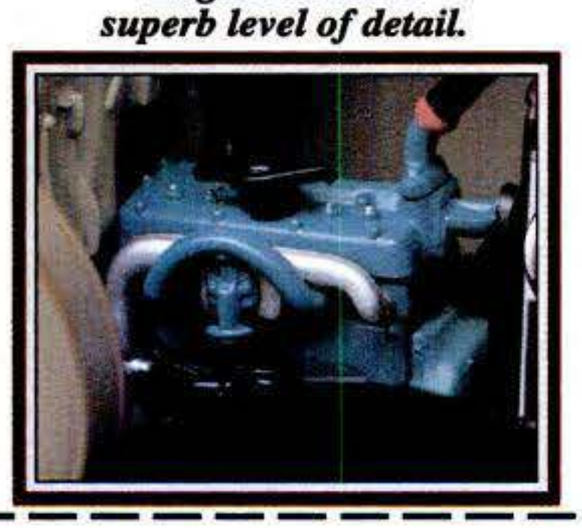
Meticulously handcrafted in die-cast metal—features working rumble seat!



Rumble seat opens smoothly.

Engine boasts a superb level of detail.



In 1927, Henry Ford introduced the beautiful Model A to replace the legendary Model T motorcar — the beloved "Tin Lizzie." When the American public saw "The New Ford," it was love at first sight. The Roadster's racy styling — and its jazzy genuine leather rumble seat — represented high-fashion motoring at its finest. Now, you can acquire an amazingly detailed replica of this classic American convertible.

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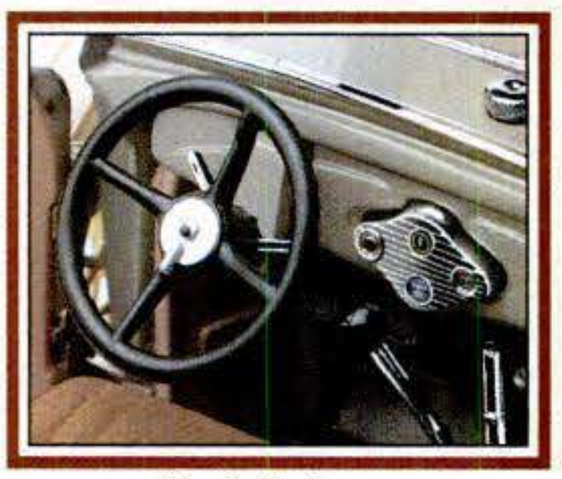
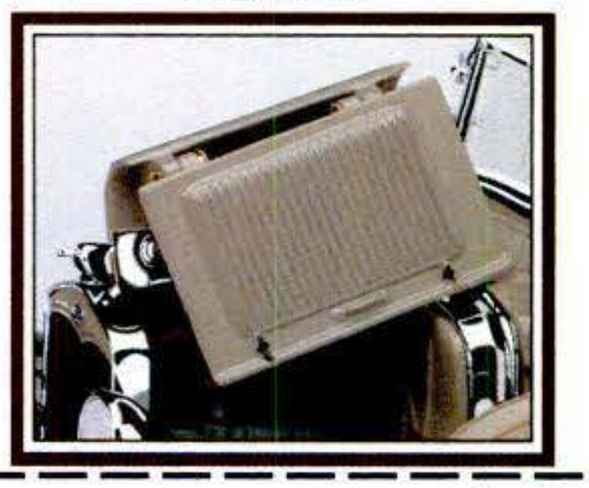


Dash features readable gauges.

Hood opens on both sides.



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NOT QUITE THE FACTS

A Comedy of Errors

SPACE, the physical world, the human body, chemistry, plant life, medicine —these are just a few of the subjects under the broad umbrella of science. This month, we focus not on scientific facts themselves, but on students' sometimes hilarious misunderstandings or misinterpretations of those facts. This sampling was sent to us at AskPopSci@aol.com.

When you breathe, you inspire. When you do not breathe, you expire.

For head cold: Use an agonizer to spray the nose until it drops in your throat.

To collect fumes of sulfur, hold a deacon over a flame in a test tube.

When you smell an odorless gas, it is probably carbon monoxide.

Nitrogen is not found in Ireland because it is not found in a free state.

Water is composed of two gins, Oxygin and Hydrogin. Oxygin is pure gin. Hydrogin is gin and water.

Three kinds of blood vessels are arteries, vanes, and caterpillars.

H_2O is hot water, and CO_2 is cold water.

Before giving a blood transfusion, find out if the blood is affirmative or negative.

The moon is a planet just like Earth, only it is even deader.

Artificial insemination is when the farmer does it to the cow instead of the bull.

Dew is formed on leaves when the sun shines down on them and makes them perspire.

A super-saturated solution is one that holds more than it can hold.

Mushrooms always grow in damp places and so they look like umbrellas.

The body consists of three parts—the brainium, the borax, and the abominable cavity. The brainium contains the brain, the borax contains the heart and lungs, and the abominable cavity contains the bowls, of which there are five—a, e, i, o, and u.

The pistol of a flower is its only protection against insects.

The alimentary canal is located in the northern part of Indiana.

The skeleton is what is left after the insides have been taken out and the outsides have been taken off. The purpose of the skeleton is something to hitch meat to.

A permanent set of teeth consists of eight canines, eight cuspids, two molars, and eight cuspidors.

The tides are a fight between the Earth and moon. All water tends toward the moon, because there is no water in the moon, and nature abhors a vacuum. I forget where the sun joins in this fight.

A fossil is an extinct animal. The older it is, the more extinct it is.

For fainting: Rub the person's chest or, if a lady, rub her arm above the hand instead. Or put the head between the knees of the nearest medical doctor.

Equator: A managerie lion running around Earth through Africa.

Germinate: To become a naturalized German.

Liter: A nest of young puppies.

Magnet: Something you find crawling all over a dead cat.

Momentum: What you give a person when they are going away.

Rhubarb: A kind of celery gone bloodshot.

Vacuum: A large, empty space where the pope lives.

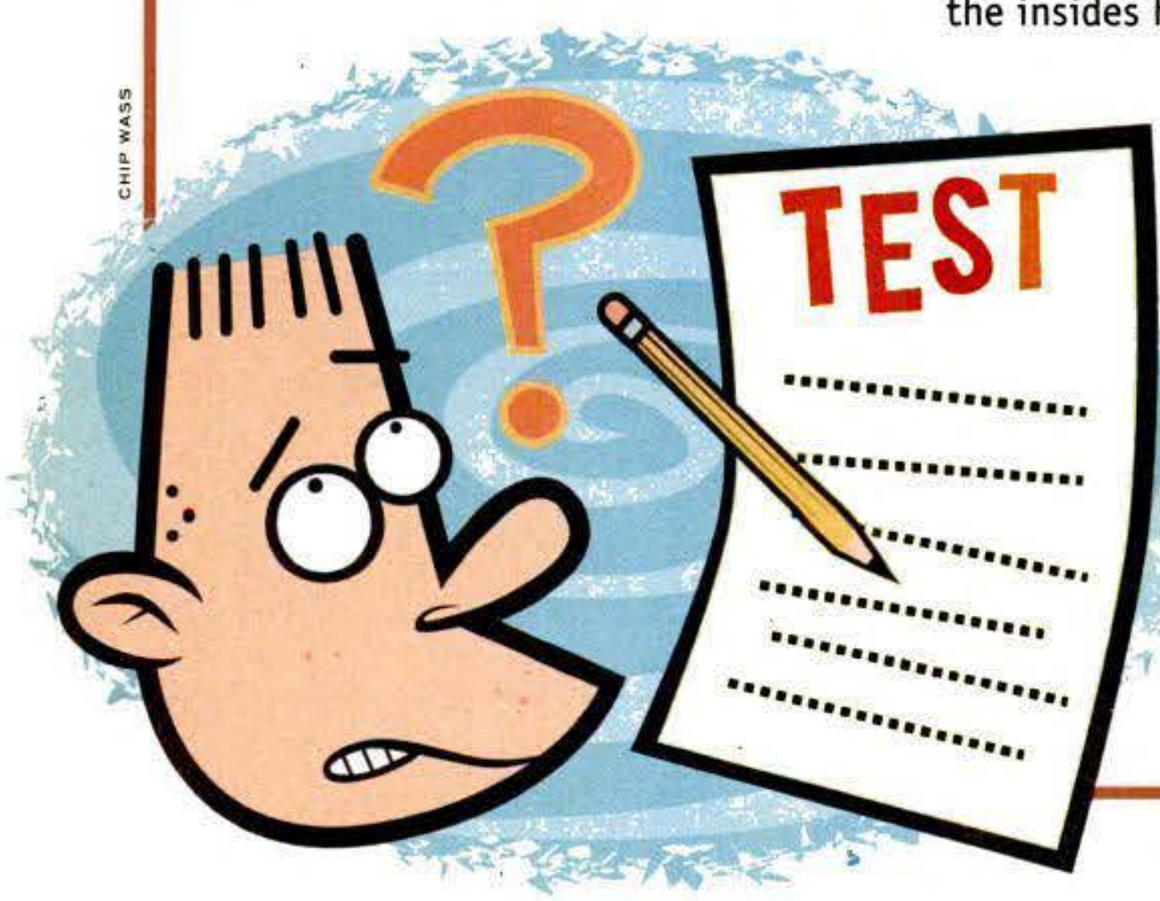
Respiration is composed of inspiration and then expectoration.

To remove dust from the eye, pull the eye down over the nose.

For a nosebleed: Put the nose lower than the body until the heart stops.

To prevent contraception: Wear a condominium.

Blood flows down one leg and up the other.



CHIP WASS

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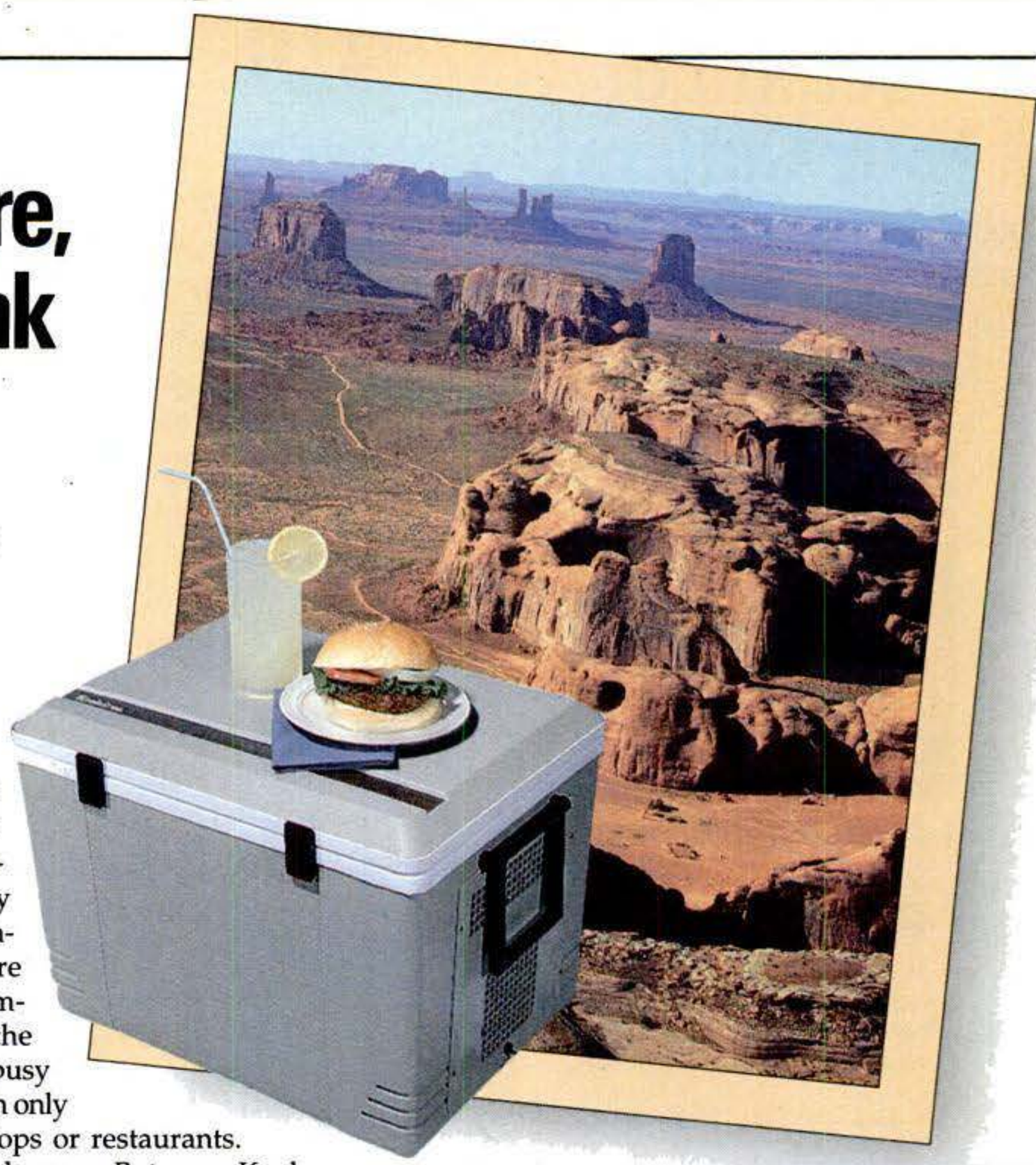
TECHNOLOGY UPDATE

500 miles from nowhere, it'll give you a cold drink or a warm burger...

This NASA-inspired portable fridge outperforms conventional fridges, replaces the ice chest, and alternates as a food warmer!



Recognize the ice cooler in this picture? Surprisingly enough, there isn't one. What you see is a Koolatron, an invention that replaces the traditional ice cooler, and its many limitations, with a technology even more sophisticated than your home fridge and far better suited to travel. What's more, Koolatron is not just a refrigerator—it's also a food warmer!

NASA-inspired portable refrigerator. Because of the tough demands of space travel, scientists had to find something more dependable and less bulky than traditional refrigeration coils and compressors. Finally, research led them to discover a miraculous solid-state component—the thermoelectric module.

Besides a small fan, Koolatron has no moving parts to wear out or break down. And it's not affected by tilting, jarring or vibration, which often cause home fridges to fail. The governing module, no bigger than a matchbook, delivers the cooling power of a full 10-pound block of ice.

From satellites to station wagons. Thermoelectric temperature control has been proven with over 25 years of use in the most rigorous space and laboratory applications. Koolatron is the first manufacturer to make this technology available to families, fishermen, boaters, campers and hunters—to anyone on the move.

Home refrigeration has come a long way since the ice box and blocks of ice. But when we travel, we go back to messy ice coolers and soggy, even spoiled food. Now for the price of a good cooler and one or two seasons of buying ice, (about five family restaurant meals) all the advantages of home cooling are available for travel—electronically!

Consider your last trip. You finally got away on your vacation, and are cruising comfortably in the car along a busy interstate with only a few rest stops or restaurants. The kids are hungry. But your Koolatron is stocked with fruit, sandwiches, drinks and fried chicken—all fresh and cold. Everybody helps themselves. You have saved valuable vacation time and avoided another expensive restaurant bill.

Hot or cold. With the switch of a plug, Koolatron becomes a food warmer for casseroles, burgers—even a baby's bottle. It heats up to 125 degrees. And because there are no temperamental compressors or gases, it works perfectly under all circumstances—even when upside down. Empty, the large model weighs only 12 pounds. And the smaller one weighs just seven. Full, the large model holds up to 40 12-ounce cans, and the smaller one holds six.

Just load it up and plug it in. On motor trips, plug Koolatron into your car's cigarette lighter. It uses less power than a tail-light. If you decide to carry it to a picnic spot or a fishing hole, the Koolatron will hold its cooling capacity for up to 24 hours. If you leave it plugged into your battery with the engine off, it will consume only three amps of power.

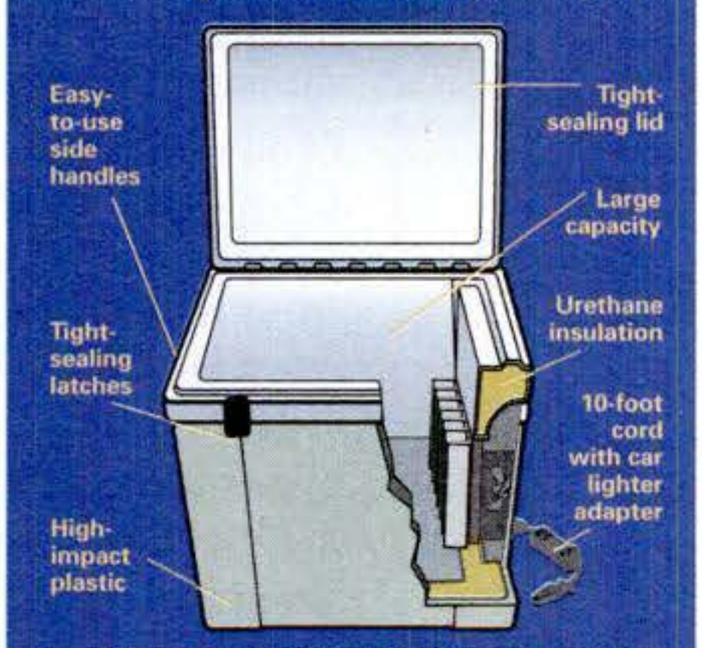
Factory-direct offer. Because Comtrad is bringing this offer to you directly, you can save the cost of middlemen and retail markups. For a limited time only, you can get Koolatron's advanced technology at the special introductory price of just $99. Call today and take advantage of this promotional pricing!

Try it risk free. As with all of our products, Koolatron is backed by Comtrad's exclusive 30-day risk-free home trial. Try it! And if you're not completely satisfied, return Koolatron within 30 days for a full refund—"No Questions Asked." It is also backed by a full one-year manufacturer's limited warranty. Most orders are processed within 72 hours and shipped UPS.

Koolatron is compact enough to take to your campsite, on a picnic or on the road in your car.

Koolatron comes in two convenient sizes; one holds 30 quarts. The other holds seven quarts.

The refrigerator from outer space



The secret of the Koolatron cooler/warmer is a mini thermoelectric module that effectively replaces the bulky piping coils, loud motors and temperamental compressors used in conventional refrigeration. In the cool mode, the Koolatron reduces the outside temperature by 40° F. With the switch of a plug, it becomes a food warmer, going up to 125°.

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We live in an old house, and some years ago we switched from an old oil-fired boiler to a new boiler with a gas power burner. It provided less costly heating, but the chimney has deteriorated from exhaust gases condensing. What do we do now?

D. Pennington
York, Pa.

NATURAL GAS contains more moisture than oil, so it gives off more moisture when it's burned, says Mark Stultz of the American Gas Association. In fact, the Department of Energy estimates that a high-efficiency furnace for an average-size home, for example, can generate as much as six gallons of water per day.

For that reason, explains Stultz, the chimney must be properly sized and lined. At the time of your conversion from oil to gas, the installer should have followed national and local codes that outline the appropriate size and lining for your gas appliance. (One common lining material is clay.) Also, the chimney should have been cleaned.

If you are concerned about the condition of your chimney, Stultz recommends you have it inspected by a heating, ventilation, and air-conditioning contractor. Your local utility may also be a helpful resource. For more general information about gas heating systems, call the DOE's Energy Efficiency and Renewable Energy Clearinghouse, at 1-800-363-3732, and ask for the pamphlet, "Improving the Efficiency of Your Gas Heating System."

What is the fastest helicopter speed and altitude?

P. Shuler
via electronic mail

OFFICIAL records for Aircraft are sanctioned by the Federation Aeronautique Internationale, which lists a helicopter speed record of 249 mph set in 1986 by a Westland Lynx. It was equipped with a rotor developed under the British Experimental Rotor Program (BERP).

The BERP rotor's composite blades have machete-shaped tips that reduce the formation of drag-inducing supersonic shock waves on the advancing blades and delay the onset of retreating-blade stall—the phenomenon that ultimately limits helicopter speed.

A French Aerospatiale Lama set the world's helicopter altitude record of 40,820 feet in 1972.

Why does the 1993 Ford Ranger pickup with a seven-foot bed have two, one-leaf fiberglas springs in the rear when other Ranger pickups have ordinary steel-leaf springs?

Hayden Shepley
Toughkenamon, Pa.

YOU HAVE A rare truck—one of some 2,000 1993 Ranger pickups equipped with experimental fiberglass springs (in some long-bed and supercab models) that were part of Ford's effort to try composites in a production vehicle. Ford says these springs are durable, but too expensive when compared with steel springs. Thus, the program was dropped in mid-year.

Often when I read the newspaper, one page will have a horror story regarding ozone depletion in our atmosphere, and the next will highlight the horrific problem of ozone pollution in our cities. Why can't we solve both problems with a "location transfer" of material?

Ian T. Austin
Lake Oswego, Ore.

THIS IS AN appealing idea, because ground-level ozone is identical to stratospheric ozone. But location is everything: High in the sky, ozone shields us from the sun's ultraviolet

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Dear Reader, we know you're interested in technology and innovation. We want your help to make POPULARSCIENCE a magazine that satisfies your interests. Please fill out this questionnaire and mail it to **PSFeedback, 2 Park Ave., New York, NY 10016. Or fax it to us at 212-481-8062.** Or fill it out online at **http://www.enews.com/magazines/popsci** In future issues, we'll share the results of the Reader Poll. Thanks!

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2. Nintendo
For more information, visit Nintendo's Web site at www.nintendo.com.

HOME IMPROVEMENT

3. Genie Garage Door Opener Safety and Maintenance Guide A valuable brochure to teach your family about garage door safety and the ins and outs of garage door and garage door opener maintenance. Free.

4. Gutter Alternative
A two-color brochure from *Rainhandler* provides information on its patented alternative to gutters. It gently disperses the rain from the roof of your house. There are no downspouts, no clogging, no cleaning, and no trenching. It's made of rugged aluminum that is virtually invisible on your home. Free.

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radiation, which can cause skin cancer. At ground level, on the other hand, ozone—the main ingredient in smog—is a dangerous respiratory irritant.

So why not put the "bad" ozone where it can do some good? Unfortunately, ozone is an etremely reactive molecule that's constantly on the prowl for a chemical coupling. It doesn't last long enough to survive a trip to the upper atmosphere.

A friend of mine says the sky is blue because of some sort of reflection of the ocean. My father claims it's because the sun absorbs all the light/colors of the spectrum other than blue. Who is correct?

Vincent Chu
vcp@sirius.uuserv.net.tw

YOUR FATHER is thinking along the right lines, but he and your friend are both incorrect. Sunlight is white, because it contains all the colors of the spectrum. But as it travels toward us, the light is scattered by gas molecules in the atmosphere. The shorter the wavelength of light, the more it scatters. Blue rays have the shortest wavelength, so they scatter the most, making the sky look blue.

The ocean is blue for the same reason. As light passes through the water, the blue rays scatter most, so they are the ones we see. But light penetrates somewhat before scattering, so only deep water looks blue.

What's the current status of teraflop computers and what technologies are researchers using to reach that trillion instructions per second milestone?

KelleyM260@aol.com

INTERESTINGLY, though the elusive goal of the teraflop was once the purview of supercomputer makers, the race to develop the teraflop computer has shifted to a massively parallel computer based on the next generation of off-the-shelf Intel microprocessors. The project to watch is a contract awarded to Intel by the U.S. Department of Energy in which 9,000 central processing units based on the successor to the Pentium chip (dubbed the Pentium Pro) will be used to run software dedicated to solving a particular problem: simulating a nuclear explosion. The teraflop computer will be able to access 283 gigabytes of memory. The system, which will be considerably larger

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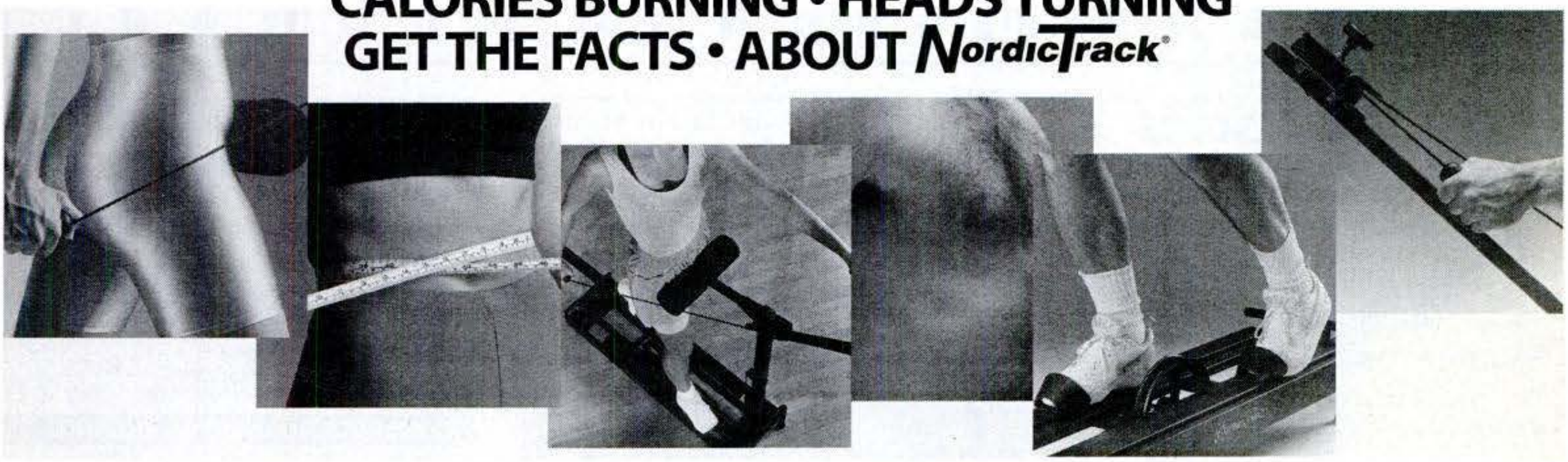

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than a desktop computer, will be located at Sandia National Laboratories in Albuquerque, New Mexico.

Why do radio stations in the western half of the United States begin with "K," while eastern stations start with "W"? And why those two letters?

lyuen@beta.delphi.com

SIMPLY BECAUSE that's the way the letters were assigned under international agreement.

The idea of using identifying call letters is almost as old as radio itself, writes Thomas H. White in *Radio Ink* magazine. In 1912, call letters became formalized under federal authority. By international agreement, the United States received combinations beginning with "N," "W," and "K." All "N" combinations were reserved for government stations. In the West, "W—" calls were used for ships and "K—" for land stations; the opposite was true in the East.

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Howell, Mich.

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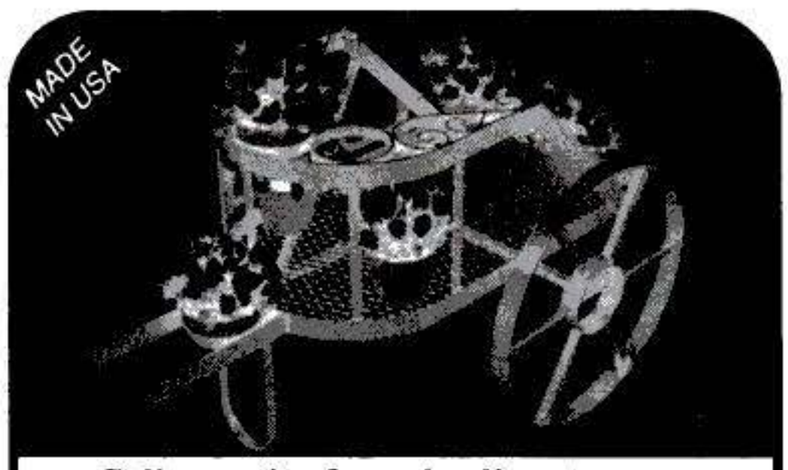

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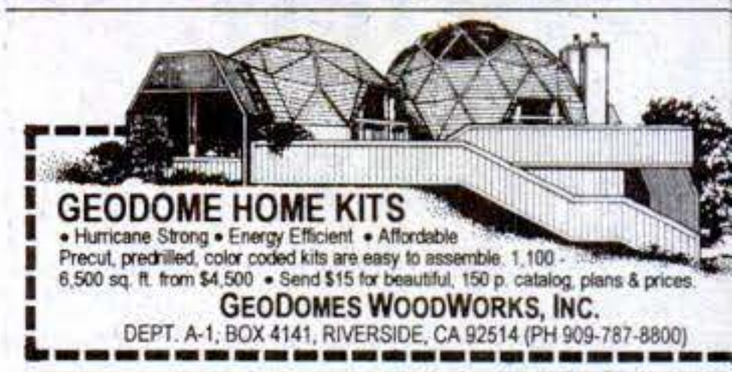

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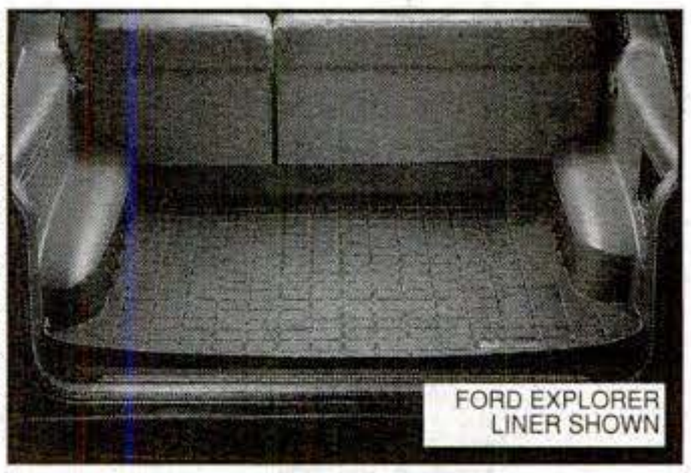

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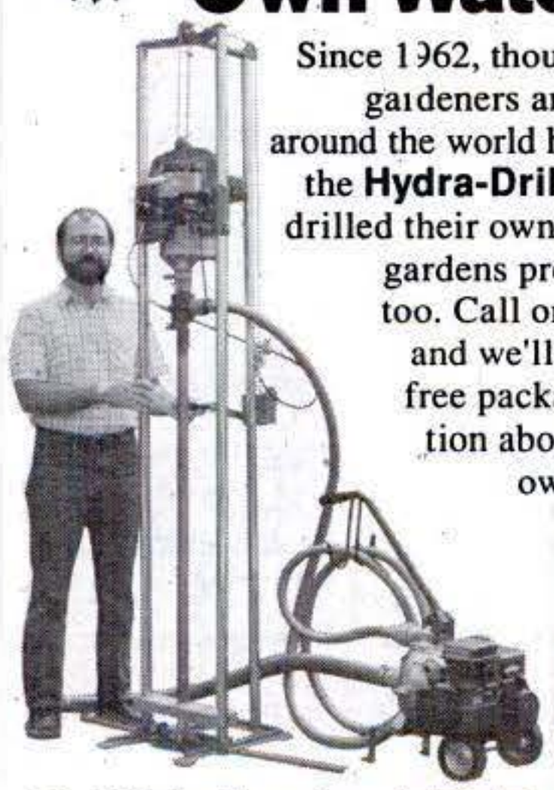

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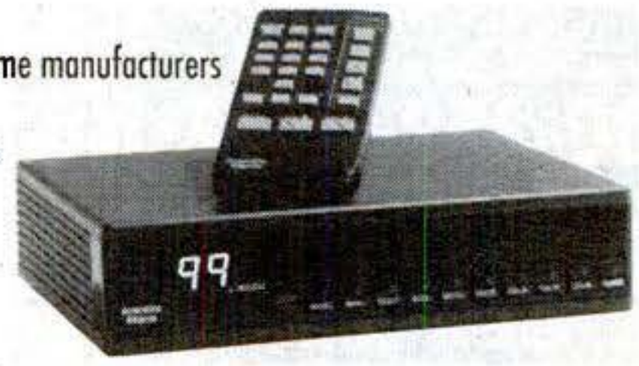

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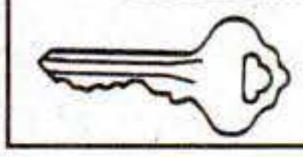

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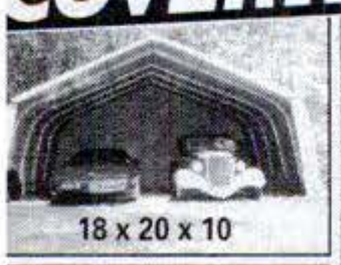

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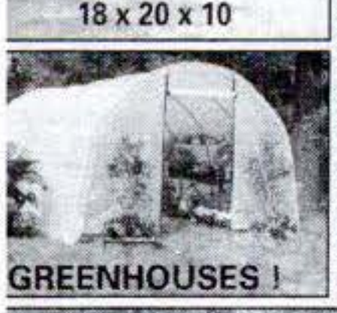

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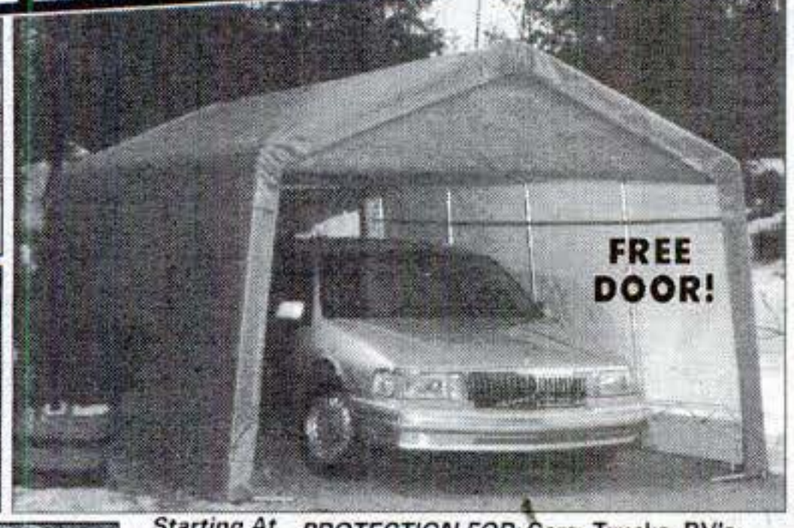

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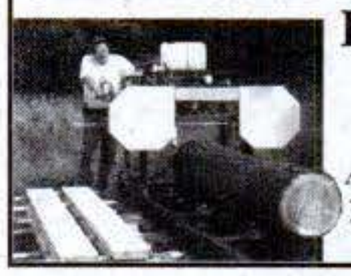

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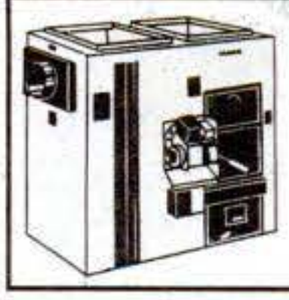

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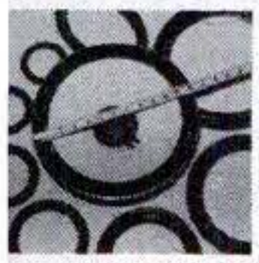

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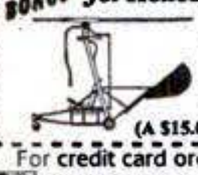

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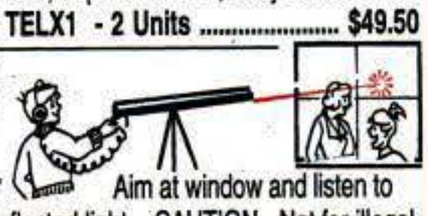

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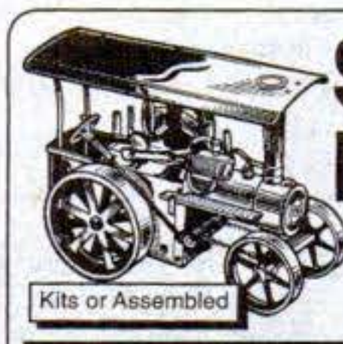

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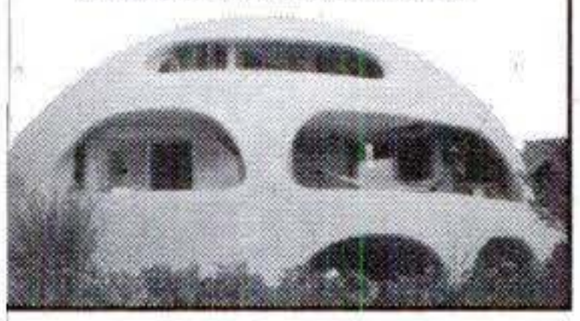

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Look Ma, No Spokes

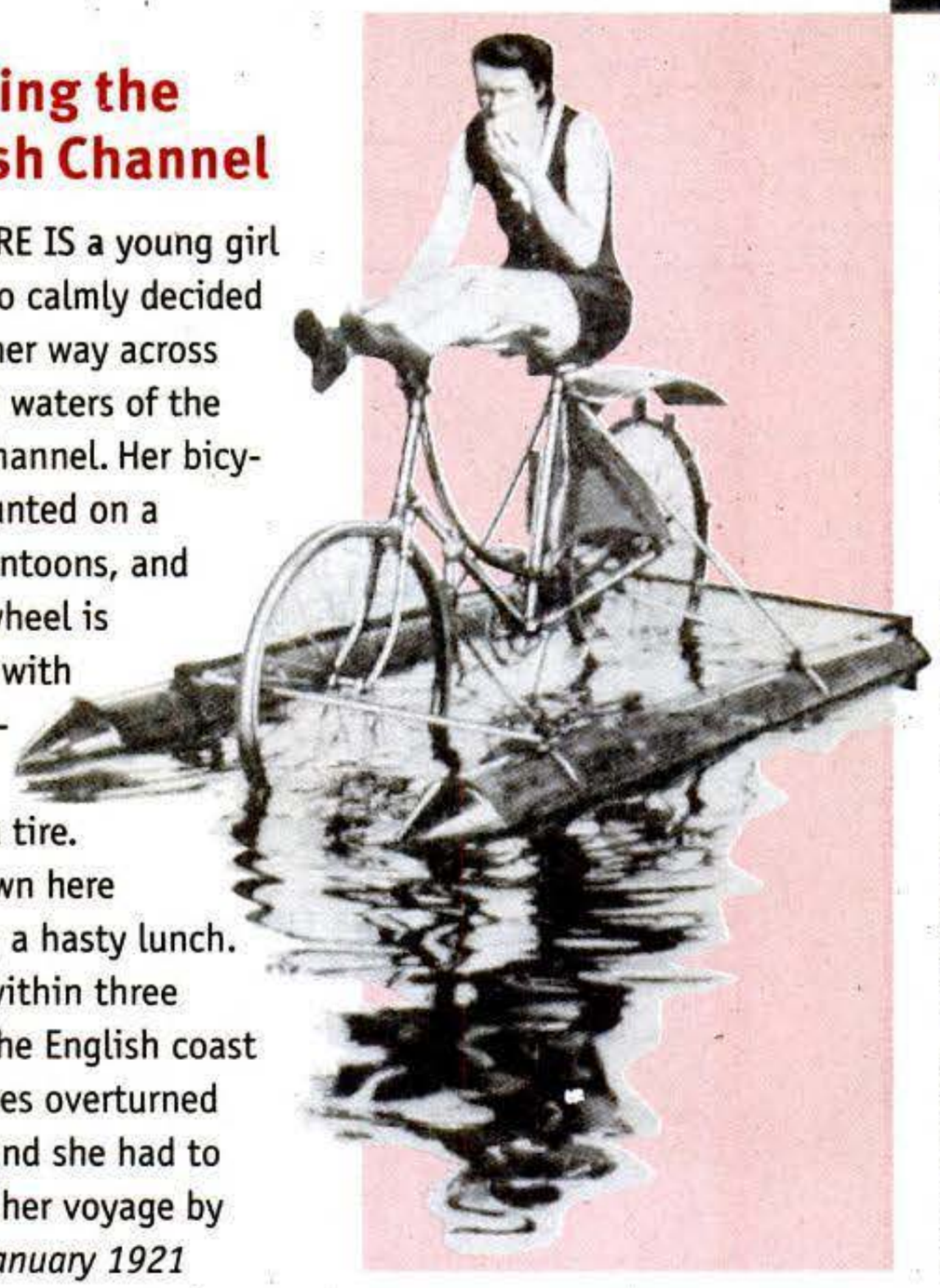
75 YEARS AGO SOLID wooded wheels are now being used on bicycles as well as for automobiles. And what's more, the tires are of solid rubber, making punctures an impossibility. Of course, solid tires do not absorb shocks as well as air-filled tires, but in these days of good roads there are not as many shocks to be absorbed.—*January 1921*

When blacktop roads lost their pristine smoothness with the onset of mass transportation, solid wheels became a disadvantage. Almost all vehicles today use pneumatic tires. But because of their aerodynamic benefits, solid composite-plastic wheels have reappeared on some racing bikes.

Best Navy Photos of the War

50 YEARS AGO WHILE THE U.S. NAVY, Marines, and Coast Guard were hammering the enemy into submission, photographers in uniform were preserving the dramatic story on film. The result is a pictorial record of inestimable value. U.S. Navy Capt. Edward Steichen selected the hundred best pictures for public exhibition. From these, POPULAR SCIENCE presented nine outstanding prints [including the one shown at right].—*January 1946*

Pedaling the English Channel



75 YEARS AGO HERE IS a young girl who calmly decided to pedal her way across the rough waters of the English Channel. Her bicycle is mounted on a pair of pontoons, and the rear wheel is equipped with small paddles instead of a tire. She's shown here snatching a hasty lunch. She was within three miles of the English coast when waves overturned her ship and she had to complete her voyage by boat.—*January 1921*

Man-Powered Flight

25 YEARS AGO EVER DREAM OF being as free as a bird? Right now, men around the world are taking off and flying planes on muscle-power alone. Fanning the flames of competition among creators of these "skycycles" is a $24,000 prize for the first flyer to navigate a two-mile, figure-eight course in England.—*January 1971.*

A plane designed and built by a university club in Southampton, England, achieved what was considered the first man-powered flight in 1961. Despite the progress documented in 1971, the Kramer prize was not won until American Paul MacCready's Gossamer Condor negotiated the course in 1977.

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